THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. X. No. 228—13th YEAR.] LONDON, JULY 16, 1861. [Subscription per Ann. { 15s. in Advance / 18s Credit.] DOUBLE No. Price 1s.

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JOURNAL OF GAS LIGHTING NEWSPAPER PENNY

THREE
MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

LORD REDESDALE'S "SALE OF GAS ACT."

DRY METERS *VERSUS* WET METERS.

LONDON, February 25, 1861.

THOMAS GLOVER begs to call the attention of Gas Companies and others to a few *facts*, which, if duly considered, must lead to most important conclusions :—

1. That since THOMAS GLOVER commenced to manufacture his Patent Dry Gas-Meters (which is now upwards of 15 years), every Wet Meter Maker of any importance in England has been compelled to manufacture Dry Gas-Meters; and in the JOURNAL OF GAS LIGHTING, of date of 12th of February, 1861, Messrs. William Parkinson and Co., successors to the late Samuel Crossley, advertise that they "intend manufacturing *Dry* as well as" Wet Meters, and it is worthy of particular notice that they intend to do so "after 40 years experience in manufacturing Wet Gas-Meters of such a quality that has enabled them, as they say, to maintain a superiority over all other; and this, be it also particularly noticed, after they had advertised in the JOURNAL OF GAS LIGHTING, January 29, 1861, "their improved low-spouted Gas-Meter with new patent float arrangement, which entirely overcomes the difficulty experienced by ordinary Wet Meter."

2. That it is quite consistent with THOMAS GLOVER'S knowledge that Wet Gas-Meters, called "low-spouted" or "compensating Wet Meters," have already been proved to be incapable of continuous working or registration, and for this reason the manufacturers of these Meters have been induced to seek the repeal of Lord Redesdale's (righteous) Sale of Gas Act.

3. That every year the Patent Dry Gas-Meter manufactured by THOMAS GLOVER has risen in favour with Gas Companies and Gas Consumers, placing him in the proud position of being the largest manufacturer of Gas-Meters in the country.

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TO CORRESPONDENTS.

The writers of the letters signed "Q. in the corner" *and* "A Gas Engineer" *must send us their names and addresses, not necessarily for publication, but as a guarantee of good faith.*

GENS.—*A stiff mixture of white and red lead, thickly applied and allowed to dry, is the only remedy we can suggest.*

NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 16, 1861.

NOTES UPON PASSING EVENTS.

THE report of the joint committee appointed by the Board of Trade, and by the Atlantic Telegraph Company, to inquire into the construction of submarine cables forms a Blue Book of the largest size, containing upwards of 500 pages, and costing £1. It is not, therefore, tempting reading to persons not pecuniarily interested in the subject; as, however, it contains a fund of information on a most important subject, we shall be doing a useful service to our readers by extracting and condensing the most striking passages. The committee originally consisted of the late Robert Stephenson, Captain Galton, Professor Wheatstone, and Messrs. William Fairbairn, and George P. Bidder, appointed by the Board of Trade; and of Messrs. Edwin Clark, Latimer Clark, Cromwell E. Varley, and George Saward appointed by the Atlantic Company. The instructions from the Board of Trade required the committee to inquire into "the best form for the composition and outer covering of submarine telegraph cables." Mr. Robert Stephenson died before the committee began to take evidence, but he "devised the course of proceeding, and determined the general experiments it was deemed necessary to take."

It appears that at the time the committee made its report, April, 1861, there had been laid 11,364 miles of submarine cables, but of these little over 3000 miles were actually working. Out of lines 8000 miles in length which are not working, 6494 miles belong to the four following undertakings, viz., the Atlantic, 2200 miles; the Red Sea and India, 3499 miles; the Sardinia, Malta, and Corfu, 700 miles; and the Singapore and Batavia, 550 miles. Professor Wheatstone suggested a submarine telegraph between Dover and Calais to the select committee of the House of Commons on railways in 1840, but the first efficient submarine telegraph between those parts was projected by Mr. Brett, and completed in 1851.

The report divides submarine cables into "shallow water" and "deep sea lines." Under the former head, they place all lines at such depths as to be liable to injury from anchors of ships, dredges, or from strong tidal currents. These are assumed to be in depths down to about 100 fathoms. Deep sea-lines are there out of reach of these dangers. The report describes separately the construction and recent condition of several existing cables, which are all presumed to illustrate various plans of manufacture hitherto attempted. It is a remarkable fact, that complete success attended the laying the first telegraph cable from Dover to Calais, in 1851. It was worked, with occasional injuries from anchors, until the spring of 1859. This was probably unfortunate for the extension of submarine telegraphy, for "The first cables became successful precedents to appeal to; further investigation was thought unnecessary; and, with no variation as regards the principles of construction, cable after cable was designed and laid down under circumstances and conditions having no resemblance to those originally encountered." But the reporters observe that, "The result was far more encouraging than might have been expected"; and, that "it is doubtful whether the transmission of messages, for ever so short a period, through a cable across the whole width of the Atlantic, was not a result worth (in a scientific point of view) all the expenditure that had been incurred."

Up to the date of the committee's investigation about fifty cables had been laid. In all, the same general principles prevail. 1. The central conductor is a copper-wire or strand of wires; 2. The insulating covering is gutta-percha; 3. The external protection, when used, consists of hemp, or other fibrous material, impregnated with pitch, or other resinous substance, in nearly all cases covered with iron or steel wire in the form of an ordinary twisted rope; 4. The cables, so prepared, have been paid out over the stern of ordinary vessels, with pressure breaks to regulate the delivery according to the speed of the vessel, which has averaged from four to six knots per hour. The conducting wire of submarine cables has, in all cases, been copper. Copper was originally used for land telegraphs; but, although it is a far better conductor than iron wire, its want of tensile strength, and especially its value to marauders, renders it inapplicable. "The conducting power of pure copper is, to that of iron, as 1 to 8; so that a copper wire, one-tenth of an inch diameter, is equivalent, as an electrical conductor, to an iron wire one-third of an inch diameter. The quality of the copper exercises an important influence on the conducting power of copper wire. If the conducting power of silver be assumed at 100, that of copper would be 90, aluminum 34, and iron 13. A table is given, showing the effect of an admixture of copper with specific quantities of various substances. These show a variation of conducting power between 98·78—"a specimen furnished by Mr. Tenant, cut from a piece 1½ tons in weight" and 14·24—that of Rio Tinto copper, which possesses no better conducting power than iron. It is scarcely possible to obtain perfectly pure copper, and there is no substance which, added to pure copper, increases its conducting power; but it is of the utmost importance that the purest and best conducting copper should be used in submarine cables. The best way of insuring this is by contracting for wire of a specified resistance per knot, because then what the copper wants in quality must be made up in quantity. The specific resistance of copper, and other metals, to the galvanic current, varies with the temperature of the conductor. In the contract for a telegraph cable, a wire affording a standard of resistance *at a specified temperature*, should, therefore, be furnished.

The *insulating covering* was the subject of a series of careful experiments, which produced exact and important results. The first attempts at insulation in the early history of land telegraphs were made by laying cotton or silk spirally over copper wire; the cotton being subsequently steeped in some resinous substance to protect it from damp; and ultimately the wires so prepared were immersed in a body of pitch or resin, and laid in wooden troughs or iron pipes. It was found that water or the heat of the sun injured these insulating materials, and the system was abandoned in favour of open-air lines, except in instances, such as damp tunnels, where covered wires were indispensable. This first led to the trial of india-rubber, which, as long as the covering remained perfect, was com-

pletely successful as an insulator. But certain difficulties in application led to its being abandoned in favour of gutta-percha. Recent improvements in the manufacture of india-rubber have caused it, after falling entirely into disuse, to be again brought forward, with every prospect of success. "Gutta-percha is, when perfectly pure and at moderate temperatures, a remarkably good insulator, and capable of being kneaded and drawn solidly on wire through dies, which avoids the joint which is necessary with india-rubber laid on strips." Great difficulties arose in its early application, partly from imperfections in the manufacture, but more from impurities in the raw material. However, the manufacturers improved their machinery, sorted the gum with the greatest care, and soon produced a tolerably pure material "for making the joints, fine ribbons of gutta-percha being used, instead of kneading over the joint with a mass of material;" and, above all, the system was introduced of covering the copper wire with several independent layers of thin material instead of one thick layer: thus the occurrence of air-holes, or defects from minute fibres in the material, were, to a great extent, avoided. The telegraph companies, at the same time, endeavoured to protect the material from oxidation, by covering the wires with tape and Stockholm tar, and enclosing them in wooden grooves; or covering them with yarn and tar, and laying them in underground pipes. This plan, especially when immersed in water, rendered the material tolerably durable. "In all cases where these precautions were not taken, the wires rapidly became useless, and many hundreds of miles have thus been abandoned;" while, on the other hand, with these precautions, many lines, which have been some years in use, are still in good working order. "It is, however, only since the commencement of the committee's inquiry that the perfectly pure gutta-percha has been produced in sufficient quantity to be practically useful, and that its high insulating properties, in a perfectly pure state, have been appreciated."

Professor Miller was employed by the committee to investigate the chemical causes of the decay of gutta-percha and india-rubber. His report is given in an appendix—one of several. Pure gutta-percha is a hydrocarbon, consisting of—

Carbon	88·96
Hydrogen	11·04
	100·00

The gutta-percha of commerce is mixed with resin, vegetable fibre, moisture, &c. The moisture is mechanically diffused through its mass, influencing its pliability and toughness. Commercial gutta-percha will remain unchanged for months in air, provided light be excluded, and the temperature be not raised very high; and it will remain unaltered for years in water, when coated with Stockholm tar, and the light excluded. Alternate exposure to moisture and dryness—especially if the sun's light falls on it—rapidly destroys gutta-percha. It has occasionally been injured by sea animals. Caoutchouc, or india-rubber, consists of a hydrocarbon of definite composition, mixed with a small quantity of resin. It is liable to deterioration by exposure to oxygen in the presence of solar light; but the gum is less rapidly injured if exposed to these influences in the native state than if *masticated*. Excluded from light, the action of air does not in long periods produce any essential changes. Experiments of a very difficult nature convinced the committee that pressure consolidated the material and improved the insulation of both gutta-percha and india-rubber, and that temperature has an important effect on both.

Experiments, detailed at length in an appendix, showed that, with gutta-percha in ordinary use for submarine cables, the insulation at 72° was not one-half as good, and at 92° not one-fourth as good as it was at 52°, and at 52° it was not one-third as good as at 32°. Perfectly pure gutta-percha was a far superior insulator, and suffered little loss of insulation until it attained a temperature of between 72° and 92°. India-rubber and Wray's compound, which are very far superior as insulators to the gutta-percha which has been ordinarily in use, exhibit little loss of insulating powers until they attain a temperature far above 92°. Gutta-percha-covered wire was entirely spoiled at a temperature over 122°, whilst Wray's compound withstood a temperature of 152°, and india-rubber of 200°. The mere process of coiling will render a gutta-percha-covered wire eccentric at a temperature of from 90° to 100°. Therefore gutta-percha wires should in no case be exposed to heat, the exact amount of which cannot be defined and regulated, and is not a desirable material for cables that have to be conveyed to or laid in the tropics, unless means be adopted for insuring that they be maintained at a low temperature.

The following is a summary of the value of various insulating materials:—1. India-rubber surpasses all other materials in the smallness of the amount of its inductive discharge, and the perfectness of its insulation. In the former respect, a coating of india-rubber is fully equal to a coating of *ordinary* gutta-percha of double the thickness. 2. Wray's compound—an artificial composition, formed by the addition of other highly insulating materials to india-rubber, and the newly manufactured gutta-percha, closely resembles india-rubber in both qualities. 3. The mixture of imperfectly conducting materials with gutta-percha, such as carbon (Mr. Radcliffe's), or pounded cocoa-nut shell (Mr. Godefroy's), reduces the insulation, and increases the induction. 4. The interposition of cotton thread between the wire and india-rubber coating, or cotton between two layers of gutta-percha, both act disadvantageously. 5. The interposition of a viscid insulator between two coatings of gutta-percha, neither decreases the induction, nor improves the insulation. It may perhaps, fill up air-holes or flaws in the gutta-percha coating.

Temperature affects the discharge so far only as it affects the insulation. Pressure does not appear to exert any influence on the amount of inductive discharge. As to the number of words per minute transmitted through various submarine telegraphs in their submerged state, the evidence gives—On the Varna and Balaklava line, 5 words per minute through 310 nautical miles; the Red Sea, 12 words through 480 nautical miles; and 5 or 6 through 730. The Atlantic varied from 1·1 to 2 and 2½ words per minute through 2500 miles. According to the evidence of Mr. Varley, the practical working of a submarine or subterranean line can only be taken at one-third of the possible speed.

"*Faults,*" by which a communication takes place between the surrounding water and the conducting wire *are fatal to* the working of a submarine cable. They arise from various causes, which are detailed in the report. The committee say—"Very efficient tests have been devised to ascertain the existence of faults in a covered wire during or after the process of manufacture; and we do not doubt that a cable may be delivered by a manufacturer entirely exempt from faults." The commission give a decided preference to the newly-introduced pure gutta-percha, which can be so applied to copper wire as to be an efficient insulator under ordinary circumstances, and "will last for many years when used in moderate temperatures, coated with Stockholm tar, protected from light, and covered with water." India-rubber, as recently improved, and Wray's compound have both great merit, but sufficient time has not elapsed to prove the durability of these new materials. The paragraphs of the report on the external protection of the cable are too long and too much in detail for us ever to attempt to condense. This covering must vary according to whether the cable is to be laid once for all in deep waters, or in shallow waters, whence it can be raised for repairs. "It should be such as to protect the internal core against injuries in laying or raising for repairs, against the attacks of marine animals, against abrasion on a hard bottom. It should be such as to give the cable sufficient specific gravity to insure its sinking evenly. The material by which strength is given to the cable should be effectually protected against corrosion, and arranged so as to furnish the required strength with the minimum amount of elongation.

The construction of a shallow-water cable must differ from that of a deep-sea cable. For this class of cables, the preservation of the outer covering from corrosion is of the first importance. The most desirable covering is a strong metallic covering not liable to corrode in sea-water (a coating of tin over iron has been suggested), rather than iron wire covered with hemp or other material. For cables beyond the reach of anchors, and even of strong currents, it may be necessary to employ iron or steel wires to obtain the necessary strength for raising, when repairs are required. The iron or steel wire must be protected with some outer covering—tarred yarn, protected by a cheap compound of gutta-percha or india-rubber. The wires, by which strength is to be given, should be laid on longitudinally, or with a very slow turn, and must be kept in place by a special binding, or by a covering compound. The outer covering should be so applied as to prevent a strain coming on the core, and the specific gravity should be adapted to the depth, and be such as to insure the cable's sinking

evenly. The safest core for a submarine cable, is a strand of the *purest* copper, solidly constructed, by one of several methods described, coated, according to the locality in which it is to be employed, with purified gutta-percha, or with india-rubber, protected by a covering of gutta-percha, and the whole sewed round with tarred hemp to form a bed for receiving the protecting external wires; each coating of insulating material to be tested in water of a specified temperature, to ascertain that its insulation was equal to a specified standard. The size of the conductor and the thickness of the insulating material should be such as to allow of the line being always worked with moderate currents. Before deciding on the route in which a submarine cable is to be laid, a detailed survey should be made of the nature and form of the bottom of the sea. In such a survey, it is of more use to ascertain the relative differences of level at every step than the actual depth of the sea. An instrument for defining the actual outline of the bottom of the sea is much wanted. The actual position in which a cable is laid should be defined with the greatest precision attainable, to facilitate future repairs.

For laying submarine cables with the utmost possible facility and efficiency, it would be necessary to build ships for the special purpose—of large capacity—to admit of the cable being easily coiled; the hold, isolated from the engine-room, of a form to allow the cable to be paid out without materially altering the trim of the ship; steady in a rough sea; and with sufficient power to enable it to maintain a speed of from four to six knots per hour, in the direction required, in any weather. Such a ship, it is believed, would be found useful for the ordinary purposes of commerce, when not employed in laying cables. As to contracts, the report recommends that the specification for the manufacture should be drawn up by the engineer, and include clauses reserving to the engineer the right of approving of all the arrangements to be made. The contractor, although he may not make all the parts of the cable, must be liable for its fulfilling the terms of the specification—that, for instance, the core is delivered in a specified electrical condition. The contractor should be under a certain pecuniary, but defined, liability. He should be paid the actual cost of laying, and derive his profit from an annual payment for maintenance, spread over a certain number of years. Thus, the longer the cable lasted without repairs, the greater would be the profit of the contractor.

In the above abridgement of this voluminous report, we have endeavoured to give information on points likely to be useful and interesting to the general public, feeling assured that those practically and scientifically interested in submarine cables will be induced to refer to the volume itself. It is to be hoped that, as the Government have thus obtained the information they required, they will use it, before making any further contracts with either companies or cable-makers.

The discussion on Thursday last in the House of Commons, on the vote of £643,724 for public education, was, taken altogether, satisfactory. First, the number of children educated has increased, while the cost has diminished. The earliest report gave the numbers educated at 1 in 17; 1833 gave 1 in 11; and the latest report 1 in 7 and a fraction—as high a proportion as any country in Europe. In 1839, the sum granted was £30,000; in 1859, £761,000; and this represented at least an equal amount subscribed by the public. The number of children under inspection at the present moment is 962,000 and the estimated cost is £803,000; last year, the number was 880,000, and the cost was £798,000. Secondly, the Government will attempt to amend the present system, under which a few superior boys are forced into pupil-teachers and crammed into schoolmasters—too clever by half for their real business—while the great majority of the rural children leave school at ten or eleven years of age, unable to cypher, write, or even read sufficiently well to find their education useful in the business of life or amusing in their leisure hours. Lastly, the opposition in the persons of Sir John Pakington and Mr. Henley, fighting a triangular duel with Mr. Robert Lowe, showed distinctly that the desire to extend a solid education to the working classes is equally shared at the present day by statesmen of every shade of political opinion. Sir John Pakington was happy in illustrating the absurdity of the science-art prizes, distributed at a cost of £100,000, while the most destitute classes and schools are hungering for mere crumbs of education. Sir John mentioned that his youngest son had entered for and carried off one of these art prizes, and that a cousin of young Pakington's had been equally fortunate; and he asked whether it was worth while to stimulate the science and art of young gentlemen while 15,000 elementary schools were languishing in need of trifling aid? Mr. Henley quoted, with great effect, a description from one of the education reports of what a schoolmaster for the poor should be:—

> The occupation of an elementary schoolmaster is not well suited to a young man of an adventurous, stirring, or ambitious character; and it is rather a misfortune than otherwise when persons of that temper of mind are led into it by the prospects which its earlier stages appear to afford of rising in the world, socially as well as intellectually. It is a life which requires a quiet, even temper, patience, sympathy, fondness of children, and habitual cheerfulness. It wants rather good sense and great intelligence than a very inquisitive mind or very brilliant talents; and the prospects which it affords appear well calculated to attract the class of persons well fitted for it;

and contrasted this description with the monsters of memory, the walking cyclopædias produced by the forcing system; and he had a fair joke at the education commissioner who deplored the absence of instruction in "sanitary science" and "political economy" in the education of boys ten years old. We cannot tell without trial whether the plan about to be tried, of making the rewards of the schoolmaster depend on the general proficiency of his school in reading, writing, and arithmetic, will succeed, but it deserves to be tried, and is a move in the right direction. With proper discipline you may put what has aptly been called these knives and forks of learning into the hands of most village children. No class of the population has more time on its hands than this during one half of the year. When a child can write and read with ease and pleasure, the night school of the winter months, and, better still, the lending library and book-hawker, will supply as much education as each is capable of retaining. At present, two-thirds of national school children only get enough education to have the sight of a book, or pen, or slate. We want a more humble class of teachers, and a supply of better—that is, more instructive and more amusing—school books, in order that we may obtain a real return for the vast sum expended on education. But we are on the right road; the subject has passed from the state of theory to that of practice; and, having first neglected, we have next a little overdone, the work; we shall no doubt soon reach the happy medium.

Circular to Gas Companies.

Two judgments have been delivered since our last, in appeals against assessments on the mains of gas companies, which will, we apprehend, exercise a beneficial effect upon the disposition of parochial authorities to adopt the exaggerated views on this subject, which Messrs. Penfold and Hughes, and, we regret to add, Messrs. Anderson and Penny, have of late propounded. In one case, heard before the Recorder of the City of London, and of which a full report will be found in another column, a rate of £838 was reduced to £83. 9s.; and, in the other case, of the Imperial Gas Company and Paddington parish, heard before the Assistant-Judge at the Middlesex sessions (the report of which press of other matter compels us to reserve), a rate of £4005 was reduced to £2717. We defer our remarks on the latter case till the publication of the report of the proceedings; but, we may remark that the two judges adopt different principles in deciding the aggregate assessable value between the various parishes in which the works and mains are situated; the Recorder deciding it according to the quantity of apparatus in each parish, on the principle laid down by the Court of Queen's Bench, in the old Cambridge case; and the Assistant-Judge, on the principle enunciated in the West Middlesex (Hampton) water case. In the Clerkenwell case, which was decided by the Assistant-Judge, in November last, he adopted the principle of the Cambridge case; but, for the future, we presume that in his court the Hampton principle is to prevail, and a perplexing conflict between two courts of equal authority is thereby created.

Both judges, however, concur in their preference for the audited accounts of the companies over the theoretical and speculative accounts manufactured for the purposes of the respondents by Messrs. Penfold, Anderson, and Penny. In the Bishopsgate case it savours of the ludicrous, to find Messrs. Penfold and Castles, surveyors by profession, enlightening the court as to the expenses of carrying on a gas manufactory, and disputing the accuracy of the figures sworn to by the officers of the company; while, on matters more immediately within their province—such as the value of land and buildings—they had made no valuations of their own, but had adopted those of

Mr. Penny, the coal-merchant, and Mr. Anderson, the gas engineer, who had made his valuation in two or three hours previous to the meeting of the court! Messrs. Penny and Anderson, too, on their side, professed to have made structural valuation in great detail, but were provokingly oblivious of all that concerned the cost of manufacturing gas, and their own experience on many points upon which such witnesses might have been expected to be well informed. From the very commencement of the hearing, it was evident the advisers of the parish were sensible that the assessment of £838 could not be maintained; and the onus of having made it was attempted to be thrown upon Mr. Tite, M.P., who, we understand, declines to admit "the soft impeachment," and throws it on the parochial authorities alone. The chief points of the contest will be better understood by the following tabular statement of the figures relied upon by each of the parties;—

	Appellants.	Respondents.	Judgment.
Gross profits of the trade . .	£2,860	£7,351	£3,224
Tenant's capital	12,000	10,000	10,000
Tenant's profits	1,800	1,500	1,500
Rent which a tenant would give for the whole works and mains	1,060	5,851	1,724
Renewal and reproduction .	456	1,088	456
Insurance	125	11	100
Net assessable value of the whole works and mains . .	479	4,752	1,168
Net assessable value in St. Botolph, Bishopsgate . . .	34	737	83

The difference between the rent which the judgment assigns as that which a tenant would give, and the rent upon which the estimates of the appellants were based, arises from the Recorder having disallowed £364 from the expenses of carrying on the works, on the ground that they were charges connected with the administration of the company as a joint-stock body, and were consequently expenses with which a tenant would not be chargeable. He also reduced the claim for tenant's profits from £1800 to £1500, and for insurance from £125 to £100; but, in all other respects, he admitted the figures and data contended for by the appellants, and gave them their costs.

The Parochial Assessments Bill appears to be shelved for the session. The select committee of the House of Commons, to whom it was referred, met only once, to appoint a chairman and consider the course of procedings; but no report has been made, and the general impression is, that no further action will take place in the matter this session.

Mr. Clive, the Under-Secretary of the Home Department, has, to the surprise of everybody, given notice of his intention to introduce a bill to amend the Metropolis Gas Regulation Act of last session. Members of the Government generally require considerable pressure before they can be brought to recognize grievances, and adopt measures for their redress; and it seems the more extraordinary that Mr. Clive, who has opposed any amendment in the Sale of Gas Act though strongly urged to do so, should volunteer to amend an Act so recently passed, against the operation of which there are no complaints. We have reason to believe that the bill has been prepared by Mr. Marriott, for the purpose of empowering some local authority to appoint inspectors of meters in the metropolis, which the Middlesex and Surrey magistrates have objected to do; and, in consequence of their inaction in the matter, the Sale of Gas Act is likely to become a dead letter in that part of the kingdom where it is of most importance that it should be carried into effect. The object of the bill is to amend the Sale of Gas Act by a side-wind, so far as to secure its being brought into operation in the metropolis, without opening the general question of the amendment of the Act in other respects. It may be characterized as a skilful "dodge" by which the advocates of the Sale of Gas Act in its present state may see it carried into effect, without alteration, in the metropolitan districts. The bill was introduced last night; and, if it meets with no opposition, it may possibly pass during the present session; but, we understand, it will be withdrawn should any attempt be made to alter or delay it.

We recently noticed the unpleasant complication that had arisen in Sheffield, in consequence of the gas committee having instructed the meter inspector for that town to test the quality of the gas, and the variation between his reports and those of the scientific gentleman who had been for some years appointed by the town council to perform that duty. The duly-appointed examiner was naturally indignant at this interference with his duties, and he presented a report to the council, impugning the correctness of the meter inspector's experiments, and making some disparaging observations on his mode of testing. This disagreement became a party question in the town council, and angry words passed between the friends of the rival officers. At the meeting of the council last week, the matter was disposed of by the reception of the report of the gas committee, in which they stoutly supported the meter inspector, and censured, in strong terms, the manner in which he had been attacked by the official examiner. Some of the results obtained, during the testing of the gas at the works, seem very extraordinary; for it is stated that, in one instance, the illuminating power of the gas rose rapidly from 17 to 22 sperm candles. No explanation was afforded of this sudden increase of illuminating power; but the gas committee hint that it was occasioned by passing the gas through naphtha, or by other surreptitious means. The gas company, we have little doubt, could very satisfactorily explain the anomaly, and such remarks in the committee's report, which recommended the reconcilement of differences, were, to say the least, extremely ill-advised. Several members of the council expressed the opinion that the rival testings of the gas had had the good effect of increasing its quality, and the courteous reply of the gas company to the hasty and intemperate application for an increase of illuminating power, and a reduction of price, has been like oil on troubled water. The gas committee express themselves perfectly satisfied with the assurance that the company will comply with their request to reduce the price and improve the quality of the gas "at the earliest moment compatible with the proper interests of the shareholders." So the matter has ended for the present.

The cheap gas movement in Scotland waxes and wanes, rises, culminates, and declines, with the flux of time. As the cry of cheap gas is heard in one town, it ceases in another; and each place in its turn greets Mr. Flintoff with cheers, listens to his lectures, makes a pretence to form a consumers company, and then gradually drops into a state of quiescence. Stirling was the last city he favoured with a visit; and, in the same paper that records his success in that ancient scene of strife, there are woful denunciations of the desertion and backsliding of Glasgow and Edinburgh, where he was so recently received with acclamations. The *North Briton*, which enlightens its readers by publishing a series of articles on the gas supply of Scotland, makes complaint in no measured language of the falling away of those two cities from the cause of Flintoff and cheap gas; and, if the representation of the state of the gas-works in Scotland given by the writer of those articles be correct, every one should join in the lament. "Without a single exception," it is stated, "their works are a mass of engineering blunders, their pipes are *thoroughly oxidized*, their gasometers are not half large enough, and their works, instead of being kept in proper order, are *generally charnel-houses and pest-holes*, through the defective state of their apparatus." This is a favourable specimen of the style; the freedom of assertion, and the absence of truth, in which the writer indulges when professing to give his readers information respecting the gas supply of Scotland. Such writing as this cannot, surely, be indigenous to "Modern Athens." It must be exotic; and we strongly suspect that *Fleet Street* was its native *habitat*.

THE FIRE IN WOOD STREET.

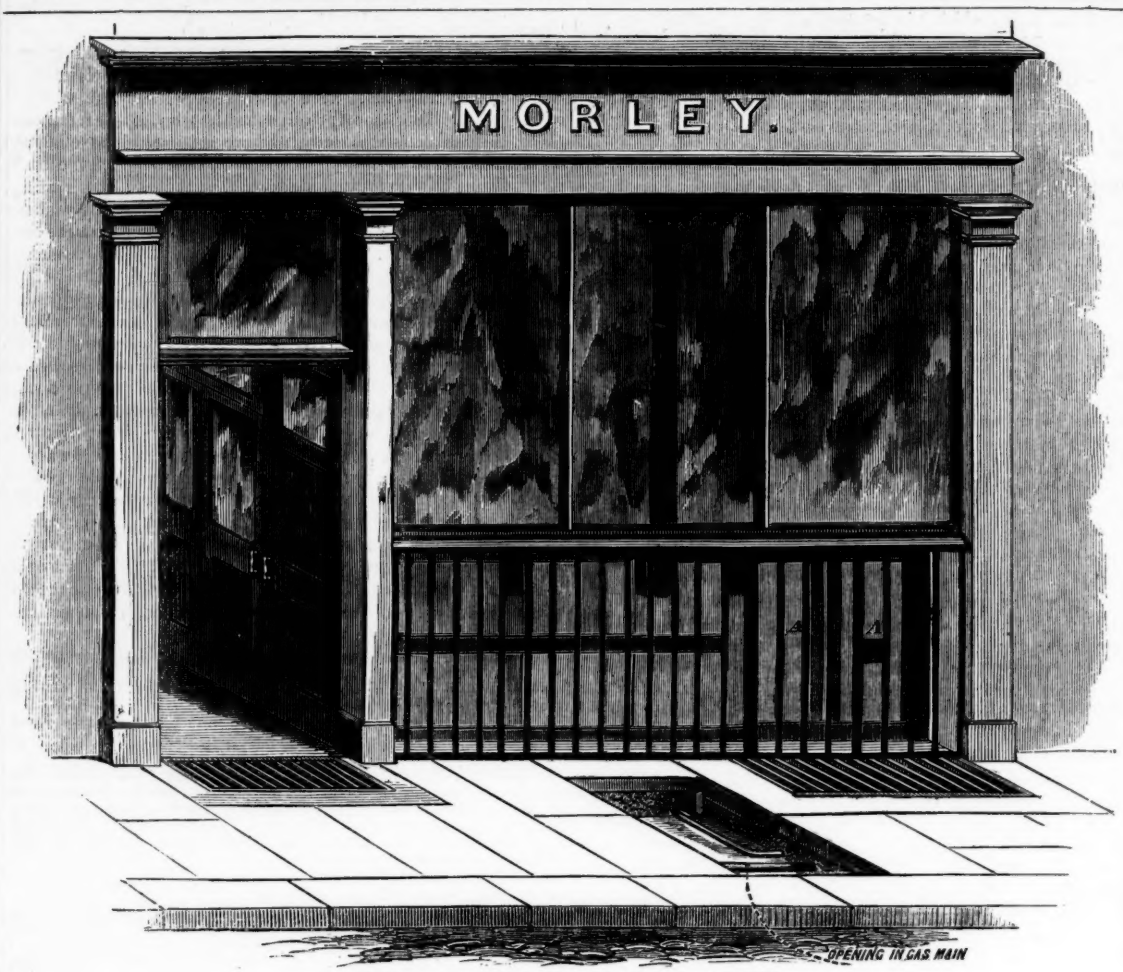
The actions brought against the Great Central Gas Company for having, through the alleged negligence of their servants, set fire to Mr. Morley's premises in Wood Street, have ended differently from our expectations. The second action, brought in the name of Mr. Sturgeon, the adjoining neighbour of Mr. Morley, came on for trial on Tuesday week; and, after it had occupied the greater part of three days, and before the plaintiff's case was concluded, the Great Central Company compromised the three actions, and consented to pay £25,000 and costs, to be released from all liabilities. The immense responsibility which this result throws on all gas companies will, we have no doubt, be considered a sufficient reason for devoting so large a space in our present number to the report of the trial. The risk to which the neglect or carelessness of a servant may expose the shareholders of gas companies is now placed strongly before them, and it is especially onerous on those companies that are not incorporated with limited liability, as every shareholder in such companies is

liable to the extent of his whole fortune for damage that may be caused at any hour by an incompetent or careless servant.

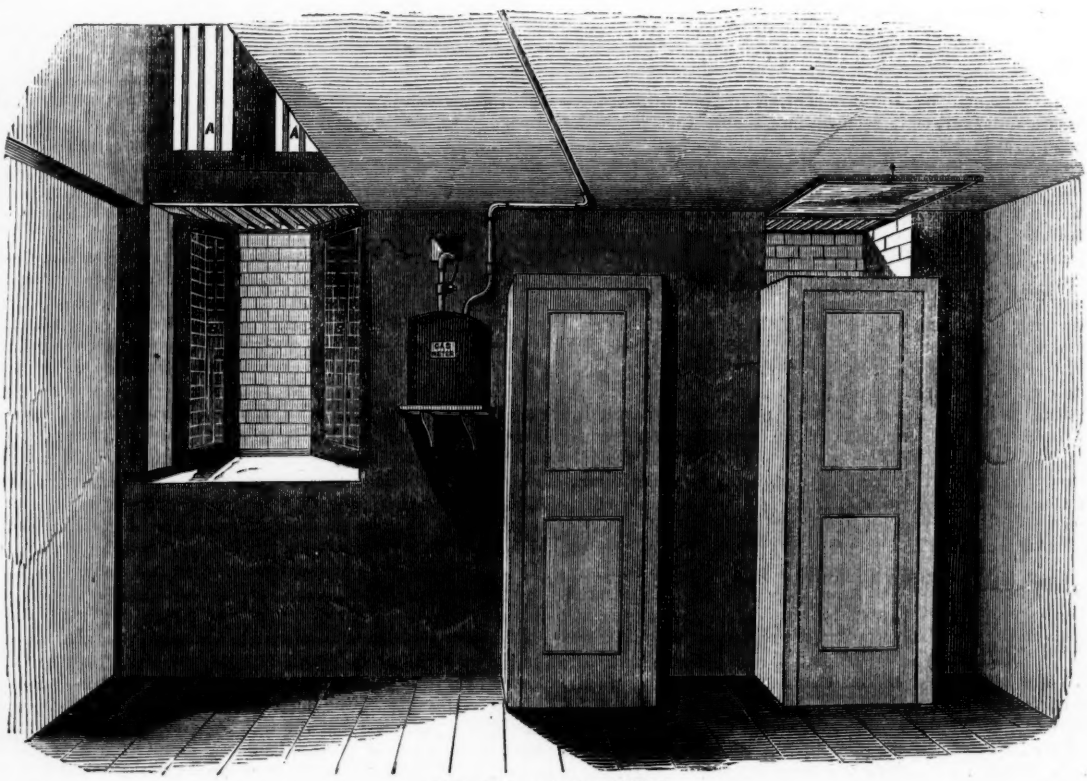
It is important clearly to understand the facts of this case, to be able fully to appreciate what is considered to be such a degree of negligence on the part of workmen as to render a gas company liable for the consequences of an explosion. Mr. Morley having arranged with the Great Central Company to be supplied with their gas, in substitution for that of the Chartered Company, an experienced service-layer and an assistant went to the premises in Wood Street, at half-past eight o'clock on the morning of the 27th of February, last year, for the purpose of laying on the gas. In the basement, into which the service-pipe was to be conducted, there were two lights burning, and one of the men requested they might be extinguished; but, on being told that the lights could not be spared, the service-layer, without further objection, proceeded to take up the flag-stones, and to dig a trench from the gas-main, which was under the footpath, to the building, and then to make a hole through the wall. The main was only three inches in diameter, and its distance from the outer wall did not exceed three feet. A hole, one inch and three-quarters in diameter, was chiselled and burst into the main; the gas continued to issue from the orifice as the men rounded it with a rymer and were tapping it; and within five or six minutes, after the hole had been made, a violent explosion occurred in the basement. The floor above was blown up; the premises were set on fire; and, in a very short time, Mr. Morley's house was completely destroyed; and the two adjoining houses, occupied by Messrs. Blenkiron and by Mr. Sturgeon, were seriously damaged. It appeared, from the evidence on the first trial, in which Messrs. Blenkiron were plaintiffs, that the only apertures by which the gas could have entered the basement were the hole in the wall, or through an open window below the level of the foot pavement. The Great Central Company's men declared, most positively, that they had stopped the hole with tarred yarn before they tapped the main; therefore, the gas could only have gained access through the window, under a grating, and four feet distant horizontally from the hole in the trench. The questions that arose on the trial were—whether it was an act of negligence on the part of the men to make the hole in the main whilst the window was open, and the lights burning; and whether they had adopted proper and reasonable precautions in tapping the main? Mr. Hawkins, the counsel for Messrs. Blenkiron, rested his case, in the first instance, principally on the fact that the workmen had neglected to bladder the main; but he abandoned that ground when it was proved, even by his own witnesses, that such a method is not generally adopted with a 3-inch main. With respect to the neglect to close the open window, the witnesses were divided in opinion, some of them considering it dangerous; and others said that, until after the experience gained by the accident, they should not have apprehended danger, as it seemed improbable that gas, after ascending from the trench, should have been drawn through the iron grating into the window below the level of the foot pavement. Lord Chief Justice Cockburn, on that occasion, told the jury that, if they thought the defendants servants had omitted anything which proper care and prudence should have suggested, or if they undertook a dangerous operation under circumstances which rendered it additionally dangerous to the adjacent property, the verdict should be for the plaintiffs. The question he put to them was—whether it would have been considered, previous to the experience gained by the accident, that the men had used ordinary and reasonable precautions? He inclined to think they had done so in all respects, excepting going on with their work whilst the lights were burning in the basement. That circumstance, he considered, materially altered the case; and, on that ground, he instructed the jury that the plaintiffs were entitled to a verdict. The jury, however, after deliberating several hours, returned a verdict for the defendants, whose servants, they believed, had taken ordinary and reasonable precautions. It was one of the features of the case, though the judge said it ought not to have any weight on the jury, that the plaintiffs were fully insured, and had been paid the amount of damage sustained; the insurance companies being, in fact, the real plaintiffs. An application was made for a new trial, and a rule *nisi* was obtained; but further arguments in the case were postponed until the other actions were tried.

The experience gained on the first trial, which took place in December last, enabled the plaintiffs, in the second action, to strengthen their weak points, and to collect additional evidence, which gave a new aspect to the case. To enable our readers thoroughly to comprehend the bearings of the question, we have given, in the next page, two views of Mr. Morley's premises, engraved from drawings produced by the plaintiffs in the course of the trial. One of them represents the exterior of the ground floor, and the other the interior of the front part of the basement, as it appeared before the fire. The evidence on the first trial tended to show that the gas entered the basement through the lower open window beneath the grating, marked BB. Not a word was then said about the window above the level of the street, marked AA, having been open at the time the main was tapped. Through that window, it was customary to receive goods into the basement down a temporary slide, the upper part being covered, so that there was no opening through which gas could escape into the ground floor above. At the trial, last week, several new witnesses were called who stated positively that that upper window was open, as well as the window below the grating, and one of them affirmed that he saw a man come through that window from the basement after the trench was made. Assuming the upper window to have been open, and that the defendants workmen were aware of it, there could be no doubt that it was gross negligence on their part to tap the main under such circumstances, and it was upon that point that the case eventually depended. Abundant evidence might have been adduced to rebut the charge of negligence if the lower window only had been open, but there was no denying that it would be very negligent to make a hole 1¾-inch diameter in the main, at a distance of 4 feet from an open window, in the position represented in the engraving. It is very remarkable that at the former trial none of the witnesses mentioned that the upper window was open, and that most important fact, if fact it were, was affirmed only by the new witnesses examined at the recent trial. It seems to have been a new light thrown upon the case, and even at the time the drawings of the premises were made, it does not seem to have flashed upon the plaintiffs, for it will be observed that the upper window is represented as closed, and the lower one only as open. We confess to have serious doubts respecting the correctness of that evidence, but it would have been directly contradicted by the service-layers had the trial proceeded, and in such a conflict of testimony it would have been difficult for the jury to decide, and the gas company exercised a wise discretion in acting on the advice of their counsel, and compromising the three actions that were pending against them, though the amount they have consented to pay will absorb two years profits of their undertaking.

The plaintiffs case was very carefully and elaborately prepared; and, among the numerous witnesses they had summoned, there was a long array of scientific gentlemen, who had performed various experiments for the purpose of proving that, under circumstances as nearly similar as possible to the opening of the main on the morning of the fire, a sufficient quantity of gas would enter the basement through the window to become explosive. In one of these experiments, a trench was dug in front of the present premises, in which a quantity of gas was allowed to escape from a 1¾-inch pipe, and the original proceedings were so closely imitated that it was feared they might repeat the explosion. In other experiments, near the gas-works at Uxbridge, a large hole was made in a wall and then stuffed with tow, and gas was allowed to escape from a 1¾-inch hole in a 3-inch main, placed at a distance of 3 feet, to ascertain whether the gas would pass through the hole. The results of these experiments were certainly surprising; and, if it astonished a body of scientific gentlemen to see gas penetrate through a ball of yarn and take fire on the other side of the wall at a distance of 6 feet, it is not surprising that a common workman should not have been prepared for such an occurrence. The experiments at Uxbridge were, indeed, decidedly in favour of the defendants, if they had any bearing on the case; but, inasmuch as the pressure of gas in the main was much greater than it could have been in the Great Central Company's main in Wood Street, after the hole was made and the gas escaping, the experiments were only valuable in the abstract, as illustrating the penetrability of porous substances by gas issuing from an aperture at several feet distance in the open air. The pressure of the gas in the main in Wood Street, shortly before the accident, was not sufficient to overcome the friction of the meters in the adjoining premises, for the lights went out; but the Uxbridge experiments were made with a pressure of eight-tenths of an inch in the main, which was nearly treble the pressure with which the gas was forced



FRONT ELEVATION TOWARDS WOOD STREET.



INTERIOR OF BASEMENT.

out of the hole before the explosion, It is satisfactory to observe, in the scientific evidence on this occasion, the absence of that exaggeration and straining of truth which is too common. Much of that evidence might, indeed, have been spared, as it did not strengthen the plaintiff's case. The great gun that decided the battle, and induced the defendants to compromise, was fired from the upper window, which was thrown open for that occasion, and it appears to have been as unexpected by the defendants, and as effective, as a close volley from a masked battery.

The moral of the great fire in Wood Street will be impressed strongly on all gas companies in the kingdom; it is, that they must exercise increased caution. After the experience, that has been gained at such great cost, of the diffusiveness and penetration of gas, modes of operating that were previously thought reasonable precautions will no longer be considered so, should similar explosions occur. The proximity of a main to the house into which the service is to be laid, of course increases the danger; and, since it has been ascertained by the experiments at Uxbridge that gas will penetrate through a hard ball of tow when three feet distant from the orifice, and in the open air, the necessity of extreme caution in such cases becomes manifest. It appears, from the evidence of one of the provincial witnesses, that the same precautions are not generally taken in London that are customary in Birmingham and other towns. In those places, the workmen are prohibited from breaking a hole through the wall of a house into which they are about to lay on gas, until the main has been tapped and prepared to receive the service-pipe, after which the orifice is closed until the pipe is ready to be fitted. The method of chiselling and bursting the holes through mains, though quicker than drilling, is a rough and less perfect mode of attaching a service-pipe to the main than by drilling, and should therefore be avoided; the necessity of closing all windows, whether above or below, should be strictly enforced; and no light should be allowed in the place where the service-pipe is to be introduced. Those are some of the precautions which the results of the recent trial cannot fail to impress on gas companies as necessary to be adopted; but, above all, it is essential that they should employ men on whose skill and care they can place full reliance; and they should bear in mind that, if they allow parsimony to stand in the way of obtaining competent persons to superintend and do the work, it may prove to be a ruinous economy.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1650.—Thomas Swinnerton, of Dudley, Port Tipton, Stafford, blast furnace manager, for "*A new or improved manufacture of coal-gas by the surplus or waste heat of the blast ovens and puddling furnaces used in the manufacture of iron.*" June 28, 1861.

1659.—James Bailey Hawkins, of North Street, Limehouse, Middlesex, plumber, for "*Improvements in the construction of cocks for drawing off liquids and vapours, and for regulating the flow or passage thereof.*" June 28, 1861.

1666.—William Clark, of 53, Chancery Lane, Middlesex, engineer, and patent agent, for "*Improvements in the destructive distillation of solid and liquid matters.*" A communication. June 29, 1861.

1669.—William Livesey, of 3, Park Cottages, Park Village East, Middlesex, for "*Improvements in wet gas-meters.*" June 29, 1861.

1670.—William Dingwall, of Dundee, Forfar, N.B., joiner, for "*Improvements in fluid meters.*" July 1, 1861.

1692.—Richard Jolley, of 47, St. John Street, Smithfield, Middlesex, for "*An air-tight enclosure for heating, cooling, or drying, infusing, extracting, or absorbing vapours and gases for manufacturing, medical, or domestic purposes, and for preserving liquids and solids, alimentary or otherwise.*" July 3, 1861.

1700.—James Morris Gale, civil engineer, of Glasgow, Lanark, and Thomas Kennedy, water-meter manufacturer, of Kilmarnock, Ayr, for "*Improvements in taps or valves.*" July 4, 1861.

1717.—Robert Angus Smith, 20, Devonshire Street, Manchester, for "*Improvements in purifying gas.*" July 6, 1861.

1726.—Alfred Noble, of Bristol, analytical chemist, for "*Improvements in obtaining products from alkali waste and gas-lime refuse.*" July 6, 1861.

1730.—Frederick Warner, of the Crescent, Jewin Street, and Thomas Clark, of Baldwin Street, City Road, for "*Improvements in apparatus for supplying water to water-closets.*" July 8, 1861.

1739.—William Coulson Parkinson, of Cottage Lane, City Road, London, gas-meter manufacturer, for "*An improved frictionless bearing for gas-meters.*" July 9, 1861.

1754.—Thomas Goode Messenger, of High Street, Loughborough, Leicester, horticultural builder and plumber, for "*Improvements in the construction of valves.*" July 11, 1861.

GRANTS OF PROVISIONAL PROTECTION.

1570.—John Dixon, of Gallowgate Works, Newcastle-on-Tyne, for "*Improvements in water-closets, and cocks used therewith.*" June 18, 1861.

1610.—Robert Russell, brass-founder, of Sheffield, York, for "*An improved valve to regulate the passage of fluids.*" June 22, 1861.

NOTICES TO PROCEED.

572.—George Eskholme, of Rotherham, York, engineer, for "*Improvements in apparatus for regulating the supply of water to water-closets, and for other purposes where an occasional or intermittent supply is required.*" March 6, 1861.

681.—Michael Henry, of 84, Fleet Street, London, patent agent, for "*Improvements in furnaces in which combustion is carried on for obtaining gases or gaseous products to be usefully applied.*" A communication. March 18, 1861.

989.—Alfred Vincent Newton, of Patent Office, 66, Chancery Lane, Middlesex, mechanical draughtsman, for "*Improvements in the construction of liquid meters.*" A communication. April 20, 1861.

1448.—Alexander Angus Croll, of Coleman Street, London, engineer, for "*Improvements in the manufacture of sulphate of alumina.*" June 7, 1861.

Parliamentary Intelligence.

HOUSE OF LORDS.

July 1, 1861.

A petition was presented against the Dublin Corporation Water Bill, from Henry Lister Maw, Esq., and John Harvey, Esq.

The Chairman of Committees informed the House that the opposition to the Bolton Corporation Bill was withdrawn.

The Lord Chancellor informed the House that the further Standing Orders applicable to the Birmingham Improvement Bill have been complied with.

July 2.

The Grand Junction Water Bill.—The Commons amendment was considered, and agreed to, with an amendment.

A petition was presented against the Birmingham Improvement Bill, from the Birmingham and Staffordshire Gas Company.

The Bolton Corporation Bill was read a second time, and committed.

July 4.

Petitions were presented against the Birmingham Improvement Bill from the Birmingham Gas Company, the Midland Railway Company, the London and North-Western Railway Company, the Great Western Railway Company, the Right Hon. R. W. Penn, Earl Howe, the Right Hon. Frederick Lord Calthorpe, Baron Calthorpe and others, Henry Morgan, of Manchester, Esq., and persons signing.

July 5.

The Staffordshire Potteries Water, the Wigan Gas, Meter, and Fitting, and the Wolverhampton New Water Bills, were returned from the Commons, agreed to, with amendments.

The Bolton Corporation, and the Dublin Corporation Water Bills, were reported, with amendments.

July 8.

The South Essex Water Bill was returned from the Commons, agreed to.

The Staffordshire Potteries Water Bill.—The Commons amendments were considered, and agreed to.

The Birmingham Improvement Bill was referred to a select committee, consisting of Viscount Torrington (chairman), Lord Conyers, Lord Fortescue, Lord Crofton, and Lord Dartrey, who will meet on Friday, July 12, at eleven o'clock.

July 9.

The Wigan Gas, Meter, and Fitting Bill.—The Commons amendments were considered, and agreed to, with an amendment; and the Bill, with the amendment, was returned to the Commons.

The Wolverhampton New Water-Works Bill.—The Commons amendments were considered, and agreed to.

The Bolton Corporation Bill was read a third time, with the amendments, passed, and sent to the Commons.

The Fylde Water Bill was returned from the Commons, agreed to, with amendments.

The Grand Junction Water Bill was returned from the Commons, with the amendment made by the Lords to the amendment made by the Commons agreed to.

July 11.

The following Bills received the Royal assent:—The Portsea Gas, the Weston-super-Mare Gas, the Kingstown Improvement, the South Essex Water, the Staffordshire Potteries Water, the Grand Junction Water, and the Wolverhampton New Water Bill.

The Fylde Water Bill.—The Commons amendments were considered, and agreed to.

The Dublin Corporation Water Bill was read a third time, with the amendments, a further amendment made, and the Bill passed, and sent to the Commons.

July 12.

The Blackburn Water Bill was returned from the Commons, agreed to, with amendments. The said amendments were considered, and agreed to.

HOUSE OF COMMONS.

July 1, 1861.

The Staffordshire Potteries Water, the Wigan Gas, Meter, and Fitting, and the Wolverhampton New Water Bills were considered, as amended, and ordered to be read a third time.

A message was received from the Lords, intimating that they had agreed to the Portsea Gas Bill.

JULY 2.

Two petitions were presented against the PAROCHIAL ASSESSMENTS Bill.

The SOUTH ESSEX WATER Bill was reported, without amendment, and ordered to be read a third time.

JULY 3.

The BLACKBURN WATER Bill was reported, with amendments.

JULY 4.

The STAFFORDSHIRE POTTERIES WATER, the WIGAN GAS, METER, AND FITTING, and the WOLVERHAMPTON NEW WATER Bills, were read a third time, and passed, with amendments.

The FYLDE WATER Bill, as amended, was considered, amendments were made, and the Bill ordered to be read a third time.

A petition was presented against the PAROCHIAL ASSESSMENTS Bill.

JULY 5.

The SOUTH ESSEX WATER Bill was read a third time, and passed.

JULY 8.

The GRAND JUNCTION WATER Bill.—The Lords amendment to the Commons amendment was agreed to.

The FYLDE WATER Bill was read a third time, and passed, with amendments.

The BLACKBURN WATER Bill, as amended, was considered, and ordered to be read a third time.

JULY 9.

A message was received from the Lords, intimating that they had agreed to the WOLVERHAMPTON NEW WATER Bill, without amendment.

JULY 11.

The BLACKBURN WATER Bill was read a third time, and passed, with amendments.

A message was received from the Lords, intimating that they had agreed to the WIGAN GAS, METER, AND FITTING, and the BOLTON CORPORATION Bills.

Legal Intelligence.

COURT OF QUEEN'S BENCH.

GUILDHALL, TUESDAY, JULY 2.

(Before Lord Chief Justice COCKBURN, *and a Special Jury.)*

STURGEON AND ANOTHER *v.* GREAT CENTRAL GAS COMPANY.

Mr. HAWKINS, Q.C., Mr. KARSLAKE, Q.C., Mr. C. POLLOCK, and Mr. HOLLAND, appeared for the plaintiffs; Mr. BOVILL, Q.C., Mr. LUSH, Q.C., and Mr. D. D. KEANE, for the defendants.

Mr. HOLLAND opened the pleadings.

Mr. HAWKINS, in stating the case, said Messrs. Sturgeon and Peacock were warehousemen and trimming manufacturers, carrying on business at No. 121, Wood Street. They were the occupiers of the old premises which, in the month of February, 1860, were destroyed by the fire to which the attention of the jury would have to be particularly directed; the premises being then numbered 121, and adjoining to other premises in the same street occupied by Messrs. Morley. The premises were situated on the west side, and occupied a great portion of Wood Street. This was an action brought by the plaintiffs against the Great Central Gas Company, for the purpose of recovering against them the amount of damage which the plaintiffs had sustained by reason of that fire. He supposed it was hardly necessary that they should go into the amount of that damage; for, probably, if the verdict of the jury should be for the plaintiffs, it would be better that the amount of damage should be assessed by some gentleman out of court, but he might state that in substance, the action was for the recovery of the sum of £13,000.

Mr. BOVILL said he might state at once that it would be much better to try the question of liability, or non-liability, and if the plaintiffs were entitled to a verdict, which he did not at all assume they were, the amount would be assessed out of court.

Mr. HAWKINS said he would not trouble the jury with the question of the damage to which the plaintiffs claimed to be entitled, it being assented to by his learned friend, that if the plaintiffs were, as he confidently hoped the jury would say they were, entitled to a verdict, the amount of damages could be settled by some gentleman out of court, who would have full opportunity of inquiring into the figures, and settling the matter between the parties. The action, as he had stated, was brought to recover damages which the plaintiffs had sustained by reason of the negligence, as they alleged, of the Central Gas Company, through their servants, in laying on gas to the premises of Messrs. Morley, on the morning of Monday, the 27th of February, 1860 It would be found from the evidence that, about ten o'clock on that morning, the men were engaged in laying on the gas there, when suddenly a very violent explosion took place, the result of which was that Mr. Morley's premises were set fire to, and in an incredibly short space of time the whole of his premises, together with the adjoining ones of Messrs. Blenkiron on the one side and Messrs. Sturgeon on the other, were utterly and entirely destroyed; the loss at the three houses being no less than from £50,000 to £60,000. The question for the jury to consider in this case was, whether that fire and consequent damage was brought about by the negligence of the defendants; for, although they were not present themselves in laying down the gas, he need hardly tell the jury that if they found the parties actually engaged in the work were guilty of negligence, those who were their superiors and employed them were equally liable as if they had been personally upon the spot. Before the 27th of February, 1860, the premises of Messrs. Morley had been supplied with gas by the Chartered Gas Company—a company which, he believed, had been established very many years before the establishment of the defendant's company, which was a rival company, incorporated in the year 1851, and in the year 1860 was competing with the Chartered Company very considerably within the City of London, in the neighbourhood where Messrs. Morley's premises were situated. It would be material that he should now call attention to the mode in which the mains of these two companies were laid down in Wood Street, and to the position of the premises of Messrs. Morley and Sturgeon in relation to them. The mains of the Chartered Company were laid down pretty nearly in the centre of the carriage-way of the street, at a distance of some nine or ten feet from the outside of these premises, along the whole length of the street. By means of a service-pipe from that main, the premises of Messrs. Morley had been supplied; and they had had no reason to be dissatisfied with that supply. It appeared that a person of the name of Cheeseman, an inspector in the service of the Great Central Gas Company, knowing that Messrs. Morley had been supplied up to that time with gas from the Chartered Company, and being acquainted with the father of Mr. Morley, made application to that gentleman to induce his son to change his supply from the one company to the other. Mr. Morley undertook to speak to his relative on the subject, who ultimately assented to the change, the Great Central Company undertaking the whole management of the affair, and engaging that Mr. Morley should have no trouble in the matter. Accordingly, the defendants sent one of their servants down to see the size of the premises, and what number of burners would have to be supplied; and, on the morning of the 27th of February, two of their men were employed to lay on the necessary service-pipe. The Great Central Company's mains were laid through Wood Street in a way which he (Mr. Hawkins) believed was somewhat novel in the City of London until within a recent period. There were two mains running through the entire length of the street—one main on the eastern side, of 10 inches diameter; and a second main, of 3 inches diameter, on the western side of the street, underneath the foot pavement, which was the side on which Messrs. Morley's premises were situated; and these mains were connected at intervals by feeders. It was from the 3-inch main that Messrs. Morley's premises were to be supplied by means of a service-pipe. And, now that he was upon this part of the case, he might mention that the distance from the 3-inch main to the outside of those premises was 3 feet 1 inch; and, therefore, it was much nearer than the main of the Chartered Company. It was necessary the jury should understand the nature of Messrs. Morley's premises as they existed before this fire took place. The model before them was, as far as it was possible to make it, an accurate representation of those premises; and, if there were any inaccuracy in it, he could only say, on the part of those who instructed him, that they had taken every pains to render it as perfect as they could; and it had been submitted to the other side with a view to any inaccuracy, if there were any, being corrected. The premises consisted of four floors—a basement floor, a ground floor, a first floor, and a floor above; the whole height of the building being about 42 feet from the ground. Communicating between the basement and the ground floor, and so on through the various floors of the building, was an open staircase, forming a sort of shaft, running through from the base to the top. The basement was lighted partially by two windows (to which he should have particularly to direct attention), and partially by gas, for the convenience of the work people, during the greater part of the day—certainly through the greater part of the winter days. In that basement floor, at the time the fire occurred, there were four gas-burners, suspended at a distance of somewhere about 2 feet from the ceiling. One of these burners was close to the front, two were about the centre of the basement, and a fourth near the hydraulic press; the latter being only occasionally used. There was another burner at the top of the stairs leading to the ground floor; and these were the only burners he believed to which attention would be called in the course of the evidence. These burners, as he had said, were for the convenience of the men at work, kept constantly alight—certainly during the winter time. In front of the premises, and over a portion of the foot-pavement, was an iron grating, and beneath that iron grating a small area, communicating with the interior of the basement floor below the surface of the footway, by means of folding windows. Over and above the pavement, there was also an iron grating, which opened inward; and, behind that iron grating, was another window, also opening inward, and through these windows, the Messrs. Morley were in the habit of sending a vast quantity of goods down into the basement story. There was a sort of headway over these windows, which entirely separated the basement from the ground floor, between which there was no communication at all, except through the open staircase, to which he had adverted. On the right hand side of the windows he had just pointed out, was another small grating, near to the entrance by the front door, which communicated with the water-closet in the basement; and over the top of the closet, communicating with the small grating, was another small window, which was kept open for the purpose of affording ventilation to that closet. There was a further opening, he was told, close to the gas-meter; but it was not necessary more minutely to describe it. Upon the morning of the fire, the Great Central Company, having obtained the consent of Mr. Morley to change the supply of gas from the Chartered Company to themselves, sent two workmen, named Bicknell and Allen, for the purpose of arranging the service. Bicknell went down into the basement floor, and saw a person, who would be called as a witness, and asked whether the lights could be put out? The man said they were necessary for the people engaged in the premises to work by. Bicknell took no further notice of the matter, and made no application to Mr. Morley, or any one else except this person, but, leaving the gaslights burning, proceeded, according to his own account, to make a hole in the wall of the house for the purpose of laying on the new service. First of all, it appeared (for this matter had been investigated already, upon more than one occasion) they dug a small trench from the Great Central Company's mains up to the external wall of the house, and then proceeded to make a hole in the wall to allow the service-pipe to enter. They did not, in the least degree, intimate any further desire to have the lights put out, or take any precaution to prevent an escape of gas. They then knocked a hole, an inch and a half in diameter, in the side of the main; and, after they had been at work some five or six minutes, a sudden and very violent explosion took place, which was preceded for two or three minutes by a powerful smell of gas. The result was, the whole building caught fire; and, in the course of a short time, very nearly the whole of the property in the three houses, to which attention would be called, was utterly destroyed. The complaint against the Great Central Company was, that they, by their servants, were negligent in the course they thought fit to pursue. It was complained against them that they were negligent in a variety of ways, and that there were many precautions which they might, had they thought fit to do so, have brought to bear upon the work they were doing, which, with ordinary intelligence and knowledge, might have been adopted by them, and which, had they been adopted, would have averted the accident. It was not for him (Mr. Hawkins) to point out or say that they were particularly obliged to adopt this or that course; it was not for him to say that they should have adopted one course more than another, but what, on the part of those who brought the action, he had to allege was, that they used no precaution; that they took none of those means that were open to them for the purpose of preventing the accident which, if they had brought common intelligence and knowledge to bear upon the subject, they would have done, and that in that way they were guilty of negligence, and should be responsible to the

extent of the damages which Messrs. Sturgeon, in this case, and Messrs. Morley, in another, claimed at the hands of the jury. In the first place, it struck one as very extraordinary that these persons who had seen the gas-burners alight below should not have insisted upon their being put out. They had seen them burning, and they knew that there was a communication between the exterior and the basement floor of the building. They had asked the people below whether the lights could not be put out, but they had not made any application to Mr. Morley upon the subject. Had they gone to him and said, "Will you allow these lights to be put out, otherwise we cannot work here without endangering your premises?" Mr. Morley, no doubt, would have said, "Put them out," or else, "come at another time when the thing can be done." But they took no precaution in the matter. It was hardly necessary to say that, if there was a hole in the wall, some 14 or 15 inches square, with gas issuing from the main within 2 or 3 feet from the house, it was impossible for a man skilled in his business not to know that that gas must escape into the premises; and if, as he (Mr. Hawkins) would show, that gas was escaping at the rate of 30 or 40 cubic feet per minute, that some violent explosion or immediate danger to the place must have ensued. He believed, however, that he was very much understating the matter when he said 30 or 40 feet, and that it would be between 40 and 50 feet; but he preferred being within the mark, as the smaller quantity, under the circumstances, would be sufficient to account for the explosion. There was one course which might have been adopted, that he would now state to the jury. On the morning in question, the windows, both above and below the pavement, had been opened. He would call the persons forward who opened those windows, so that there should not be a shadow of doubt upon the point. But the men who were engaged in laying on the service-pipe, though they knew those windows were open, in close contiguity with the main itself, and that there were three burners alight in the basement at the time, did not even take the precaution to close the windows, or ask to have them closed. It did not seem that they denied knowing the windows to be open, but what they said was, that, having made a hole in the wall, they blocked up that hole. He (Mr. Hawkins) would be able to satisfy the jury that they did no such thing; and he would also prove to them, beyond a doubt, that, even if they had plugged it up with tow in the way they said, it would not prevent the escape of gas into the premises—not, perhaps, with such a rush as it would have done had there been no tow, but yet in sufficient quantities, in the course of a minute or two, as to cause an explosion, and bring about the results which actually followed. Of course, the length of the jet of gas, and the force with which it would be propelled into the house, would depend upon the pressure in the main; but the jury would find that the pressure was sufficient to send it to such an extent into the lower part of the basement, that, even at some distance from the external wall, very speedy ignition would take place. They would find this fact particularly referred to when he called before them the scientific evidence which he had to offer. On a former occasion, it was contended that the gas which escaped and caused this explosion was not the gas of the Central Company at all. He should hardly think that an attempt like that would be made again, but, as it was done before, it was necessary he should now allude to it. He had mentioned that the Chartered Company had been supplying Messrs. Morley's premises for a considerable time prior to the 27th of February, 1860; that there were four burners in the basement, three of which were generally used, and that the fourth was only lighted when the hydraulic press was required; and that there was another burner at the top of the stairs leading to the ground floor. The fire happened on a Monday morning; and it appeared that, on the Saturday previous the burners were last used. It was the duty of a person named Jeffreys to put out those lights, and he would state that on that day he had done so, as usual. His course was to turn out the lights in the basement, and then the gas at the meter. He then went to the burner on the ground floor, and seeing the light flickering away, he knew that the gas from the main was turned off, so that no possible escape could take place; and he then turned off that burner. That no escape of gas in fact could have occurred on the Sunday would be proved by a person living on the premises, and who would state that he had occasion on that day to go down into the basement, and there was no smell of gas then. That no escape took place on the Monday morning would be proved by the person who turned on the gas then, and by others who were on the premises from half-past seven until nearly half-past ten o'clock, which was about the time the company's men cut the hole in the main; and who would prove that, up to that time, there had been experienced by no human being the slightest inconvenience or the slightest smell of gas. This would satisfactorily prove that the gas which escaped could not be from the Chartered Company's main; for, if it had been, those who came on the Monday morning must have suffered some inconvenience from it. He thought it right to mention this, though he could hardly suppose it could be seriously intended to insist on this part of the case. The evidence which he should have to offer in this respect would be so overwhelming, that he was sure his friend Mr. Bovill would not attempt to disprove it, and the jury would be convinced that there could have been no gas escaping from the Chartered Company's main; or, even if it had, it could not have done so in anything like the quantity which actually caused the explosion. The question then was, what did cause the explosion? He did not think it would be contended—it was not upon the last occasion contended—that if the hole which was made in the wall of the house for the purpose of admitting the service-pipe had remained unplugged, the company were not guilty of the grossest negligence. He denied, on the part of the plaintiff, that the hole was stopped; and he should have to lay before the jury the evidence of a witness (whose presence was not possible on the last occasion, he being abroad), to the effect that a few minutes before the fire took place he actually saw the lights shining through the hole in which the service-pipe was to run. So that, supposing it were proved by Bicknell that they had put a quantity of tow into the hole, to prevent the gas escaping into the house; yet, still, it was evidently so loosely packed in as to allow the light to show through into the basement; and therefore there was no doubt that a large quantity of gas could get through that part so left open. But, even supposing they did put the yarn into the hole, the jury would find that there was the evidence of a number of persons that this was an unsafe mode of dealing with it, on account of the property of gas to permeate through a porous body like that. Assuming, however, that the hole was effectually stopped, there were other precautions, to prevent the gas escaping into the premises, which ought to have been adopted. In the first place, the basement windows should have been closed; in the second place, the lights should have been put out, and then the gas could have been laid on without injury to the premises. But both of these precautions were neglected by the company's servants. Now, admitting for one moment that he was in a condition to establish, to the satisfaction of the jury, the fact that these openings communicating with the basement were there, let them inquire what the effect must be. Here was a large shaft formed by the various staircases leading to the different parts of the building from the basement to the top, and the effect was to create a thorough up-draught, so that, when a quantity of gas was emitted from the main within some two or three feet of the external wall of the house, it must have been obvious to any one acquainted with the properties of that dangerous fluid, if a moment's consideration were given to the subject, that a large proportion of that gas would find its way into the basement story, and, there being lighted burners there, cause an explosion. There were one or two modes by which that might have been avoided—and it was avoided by other companies—by the mode in which they actually tapped their mains. One mode referred to on the former occasion, and which appeared to be then misunderstood, was that of bladdering the main. This was effected by cutting a small hole in the main on either side of the spot where the proposed service was to be made, and then inserting a bladder in each, which bladder was afterwards inflated, making the main perfectly air-tight. When that was done, it stood to reason that, whatever might be the pressure of the gas in the main, none could find its way into the space so cut off; and thus the service could be laid on without any fear of escape. This was a course constantly adopted, preventing not only the escape and waste of gas to the company, but annoyance to passers by in the street, and danger to the premises about to be supplied. On the last occasion, it was supposed that a main was never bladdered without the use of a T-piece; but it would be seen, when the matter came to be discussed, that it was not necessary that the two operations should be combined. There was another mode, which was constantly adopted, and which, for the sake of avoiding danger to adjoining premises, ought to have been adopted here. That mode was, instead of making a hole in the side of the main directly opposite the building, by which a great jet of gas was projected along the trench towards it, to make the hole on the top of the main, and then put in an elbow for the purpose of communicating with the premises. If this had been done, the gas would not have been impelled with such violence towards the house; it would still have escaped, and been unpleasant—perhaps dangerous—to passers by, but it would have been attended with much less danger to the premises about to be supplied. These were some of the modes which might have been adopted; but neither of these nor any other precaution was resorted to, although the men must have been aware that, had they done so, the service-pipe could have been laid on with the most perfect safety. They seemed to have opened the trench in the most reckless manner, without taking even the ordinary precautions which a child would have adopted under the circumstances, and the result was the accident which was now to be the subject of investigation. He did not think he should assist the jury by going more into details at the outset of the inquiry. He should have a number of witnesses to produce from all parts of the country, for he was sorry to have to state that the plaintiffs had had the greatest difficulty in getting witnesses from the London companies to support their case. These companies seemed to have a system of their own, and it was very difficult to get any evidence from them; but the plaintiffs had been enabled to obtain evidence from persons connected with gas companies in different parts of the country, and, if it were necessary, they should be able to strengthen their case by scientific evidence. But the facts were so plain, that it seemed to him almost unnecessary to do so, for it must be obvious to any man, of the most ordinary common sense, that, to allow such an escape of gas within 3 feet of the outside wall, with windows open, and lights burning in the basement, must, of necessity, be attended with imminent danger to the house. He had been reminded of one point, but he did not know that he need trouble the jury upon it—viz., that the premises of the plaintiffs were insured. It might be said, on the part of the defendants, that this was a question between the insurance offices and the gas company; but, whether it were so or not, did not signify at all. The insurance companies were bound to pay the money to Messrs. Sturgeon, but they had a right to call upon the gas company for the damage they had been required to make good, on account of the negligence of their servants. His lordship would tell them that it did not make the slightest difference in the matter whether the action were brought to cover the loss sustained by Messrs. Sturgeon or to indemnify the insurance offices, and that the gas company, in either case, were equally liable, if they brought about this catastrophe by any negligence, either of themselves or of those whom they sent to do their work. This was a short statement of the plaintiffs case; he was afraid the jury would be obliged to listen to a great deal of evidence in support of it, but in the result he felt assured that his clients would have their verdict.

Mr. *James Morley*, examined by Mr. KARSLAKE.

I am the father of Mr. John Lee Morley, who occupies the premises, 122, Wood Street, and carries on the business of a Manchester warehouseman. Up to the 27th of February, 1860, the Chartered Company supplied those premises with gas. I am acquainted with Mr. Cheeseman, one of the officers of the Great Central Gas Company. He had spoken to me on more than one occasion, to get me to induce my son to take his gas of that company. In consequence of those applications, I introduced him to my son, and an arrangement was come to in my presence, that an alteration should be made, and the gas of the Great Central Company substituted for that of the Chartered. Mr. Cheeseman said he would see to its being properly attended to, and that Messrs. Morley should have no trouble in it whatever. I afterwards went round with Mr. Cheeseman, when he took the number of burners. I saw the inspector afterwards, when he called to ask what number of burners there were. I told him that Mr. Cheeseman had been over the premises, and he said it was quite unnecessary therefore that he should do so; he would attend to the carrying out of the arrangements, and that Mr. Morley should have no trouble with it. I think that was about the Thursday or Friday before the fire took place.

Cross-examined by Mr. BOVILL: I believe the Chartered Company's gas had been laid on to the premises some considerable time before. I understood they were burning the Chartered Company's gas at that time. I do not remember the fact of the Chartered Company's gas being laid on, or any particulars connected with it. I was not on the premises on the morning of the fire. I was there on the Saturday. I do not know whether I left before the gas was put out.

Mr. *William Jeffrey*, examined by Mr. POLLOCK.

Before and up to the 27th of February, 1860, I was in the employ of Mr. Morley as warehouseman. I was acquained with the premises in Wood Street. The front of the basement floor was divided from the back by a thick wall.

Mr. POLLOCK: Was there any communication by which, supposing you were in the front part of the premises, you could go to the back?

Lord Chief Justice COCKBURN: Will you take it that the model correctly represents the premises? That is the shortest way.

Witness: Yes, my lord.

Examination continued: It was part of my duty to put out the gaslights. There were four gas-burners in the front part of the basement. One of them was in a water-closet, and two about a third of the depth of the base-

ment, and the fourth at the back, beyond the hydraulic press. There was one burner at the top of the stairs, above the basement floor. Three of the four in the basement were usually lighted in the daytime; the one at the back of the press was only lighted when the press was being used. The model correctly shows the position of that light with reference to the press. I remember, on the Saturday preceding the fire, putting out the lights. I turned out the three burners in the basement, and then turned off the gas at the meter. I afterwards turned off the one at the top of the stairs. The meter was between the window and the door of the water-closet, in the basement, as shown on the model. I lived upon the premises; and, on the Sunday, when the warehouse was shut up, I had occasion to go through it to the water-closet, between ten and half-past ten in the morning. There was then no smell of gas in the basement, or in the warehouse, or any other part of the premises.

Lord Chief Justice COCKBURN: We have tried this before, and know something about it. Is it necessary to go into this part of the case? I mean, will it be contested that the company's gas was the gas which exploded?

Mr. BOVILL: Yes, my lord; I cannot tell what evidence they may give, but, certainly we have very great doubts about it. Your lordship will remember, that last time they called a man named Vinson.

Lord Chief Justice COCKBURN: Of course, I do not know what your case may be in any way, or whether it is necessary to go into this.

Mr. BOVILL: I believe it is, my lord.

Examination continued: I went into the warehouse on the Monday morning between half-past seven and a quarter to eight. There was then no smell of gas. I remained for some time in front of the warehouse until a few minutes to ten o'clock, when a man named Shepherd came. I then went into the back part of the ground floor, and was there when the explosion took place. There was a fireplace upon the ground floor of the warehouse; it was a small stove at the back part, which was used for keeping the crapes in condition, as they require a dry air. There was no other fireplace in any part of the warehouse. I remember the glass doors both above and below the grating by the street; they were generally open. Those above the grating were open to send goods down the slide.

By Mr. BOVILL: The grating was on a level with the pavement, and I believe on a level with the ceiling of the basement floor.

By Mr. POLLOCK: There was not any fireplace in the basement.

Cross-examined by Mr. BOVILL: Messrs. Morley's premises extended a long way back beyond what is shown in the model, and nearly to Gutter Lane. When I said I was in the back warehouse I mean I was in the warehouse beyond the depth shown here. The basement floor was used for packing. There were three or four persons generally employed there. It was not warmed in any way. Both the windows, below and above the grating, open into the basement. [The witness showed, by reference to the model, that the upper windows above the level of the pavement opened into a space which was shut off from the ground floor by means of a counter and communicated only with the basement.] Those windows were generally open in the winter time. I cannot say they were always open. At the time of the fire, I had been two years with Messrs. Morley.

Mr. BOVILL: Now, tell me, were not those windows generally opened in the summer time, and closed in the winter?

Witness: I think they were generally kept open.

Cross-examination continued: We had had some goods in on the morning of the fire. I could not swear which way they came in. When the business of the day was over, the iron doors or gates above the grating were closed. I do not know of any goods going down into the basement, through the slide, on the morning of the fire. I was not in the basement that morning, and cannot say. It was the duty of Binfield and Locke to close and open the iron grating and windows. On the morning of the fire, I was in the front part of the ground floor, at the commencement, and until a few minutes to ten o'clock—from half-past seven or a quarter to eight. I was examined at the last trial.

Mr. BOVILL: Did you then say one word about being in that warehouse from half-past seven or a quarter to eight until a quarter to ten?

Witness: I believe I said that I went into the warehouse at half-past seven or a quarter to eight.

Mr. BOVILL: But about remaining there till a quarter to ten?

Witness: I was there at the time of the explosion, and, therefore, I must have been. The explosion did not take place till after that.

Cross-examination continued: I do not know how many gas-burners there were throughout the building. There were four in the basement, and others in what we called the back warehouse. They were not alight on the Saturday previous, at the time I turned the gas off. I cannot say whether they had been alight during the day. There was only one place where we turned the gas off; that was at the meter. The burner by the press was not lighted that day. I did not go over the warehouse to see whether there were any other lights burning; they had not been lit that day. I looked at the back warehouse, but did not put out any lights there. I was at the back when I heard the explosion; it appeared to come from the front part of the house. I only heard one explosion. The beer was kept in the cellar, at the back part of the front basement. I did not have to go down there after the lights were turned out. There was no light kept burning on the stairs there on the Sunday, nor after business hours at night. It was my duty to turn off the gas, and the course I always pursued was to turn off all the lights with the exception of one, and then to turn off at the meter. I had not been told to turn off all the burners before turning off at the main. I did not know that that was the right course. The reason I left one burner alight was to know whether I had effectually turned off at the meter, by the gas to that burner being exhausted. I did not light the gas on the Monday morning. It was Locke's duty to do so. I cannot tell how many burners were lighted then in the basement. I believe there were seven or eight people living in the house. They were not supplied with gas through the meter in the warehouse.

By the COURT: The private house was over the counting-house. It was supplied with gas through a meter in the passage, on the ground floor.

By Mr. BOVILL: I do not know of there being any more meters in the house. The passage on the ground floor leading to the dwelling-house communicated by doors to the ground floor of the warehouse. The housekeeper attended to the turning out of the gas in the house. I do not know that I had had occasion to go into the basement on the Saturday, until I turned off the gas in the evening. The staircase light was not burning on the Monday morning when I went into the ground floor. I think it was when I left the front warehouse. I cannot say what time it was lighted. I do not recollect that there was any other service-pipe of the Chartered Company, except the one to the warehouse, and that to the private house.

Re-examined by Mr. HAWKINS: The beer cellar was in what we called the front basement. There was no communication between that and the back basement. There was a thick wall between the two; the doors of the cellar opened into the front basement, and the floors of both were flush, so that you walked from one into the other. I am able to say that I did turn off all the burners which were alight on the Saturday previous to the fire. It was a part of my duty, and I had been accustomed to do it for some time. Having turned off the three I spoke of, and then turned off the gas at the main, I am able to say that the light in the fourth burner was dying away, which indicated to me that the gas was shut off from the main.

Lord Chief Justice COCKBURN: You did not see it die away, but just when you saw it was dying away, you turned it off?

Witness: Yes.

By Mr. HAWKINS: Just when it got to be a small blue flame. That is the course I had adopted since it had been my duty to turn off the gas. The supply to the private house was entirely unconnected with the supply to the basement, and there was a separate meter. During the time I was in the warehouse on the Monday morning, until a few minutes to ten o'clock, there was not the slightest smell of gas there. The air in the basement was rather close generally, the gaslights being there. There were two water-closets, and a urinal opening into the basement. One of those water-closets had no ventilation except through the basement; the other communicated with a little grating through a window. That was the one furthest from the meter, and was for the private use of Messrs. Morley.

John Locke, examined by Mr. HOLLAND.

I am a porter in the employ of Messrs. Morley. I got to the premises in Wood Street on the morning of the fire about a quarter to eight. I went down into the basement, and lighted the gas in the water-closet, and also a burner in front of the press, and another at the back. I did not light the one at the press. I opened the lower windows, but not the grating. There was no smell of gas in the basement when I went there. After I had been in the basement half an hour, I went upstairs into the warehouse, and began to carry goods. When I went into the basement the second time, about half-past eight, Bicknell came to me, and asked if we could spare the lights. I told him we worked by them. I did not decline to put them out; that was all I said; and Bicknell said nothing more to me. I believe he went upstairs again directly. At that time, I was in front of the press, and the windows were still open. There was no smell whatever of gas then. I afterwards went upstairs, and returned into the basement, about twenty minutes past ten. The lights were still burning, and the windows open. There was no smell of gas then. I heard the men hammering outside, but did not go to see what they were doing. They appeared to be striking iron. There was a hole in the wall of the basement, close to where the Chartered gas-meter was fixed. It was as if a brick or two had been removed. Before that time, there had been no hole in the wall. About a quarter of an hour before the explosion, I went to the back of the basement to clean some knives. I then smelt a slight smell of gas, which increased very rapidly until the explosion took place. I only heard one explosion. I then made my escape from the premises up the stairs and out at the door of the warehouse. Before the explosion, I saw a man named Wray, who was in the employ of Messrs. Morley, in the basement. He went across to the closet. That was about four or five minutes before the explosion. He made some observation to me. When I got up the stairs, I saw the floor of the warehouse blown up, and the flames coming through. After I got in the street, I saw a body of flame rushing into the premises through the grating, from the hole in the main.

Cross-examined by Mr. LUSH: When I first got to the premises, about eight o'clock in the morning, I went upstairs to get my breakfast. There was no gas burning then in the basement. I did not go into any part of the business premises until after I had had my breakfast. When I went down, at half-past eight, there were no lights burning on the ground floor. I then turned on the gas at the meter, and lit the lights in the basement. There was no one down there, and it was quite dark. I remained there about ten minutes, and the only person that came down was Bicknell. I had lit the gas when he came in. He staid about three or four minutes. Wray was not there when I went down; he came down about five minutes after. I was examined on the last trial. I do not think I was asked who were down in the basement besides me that morning, and I said there were several. I believe Binfield was there. I do not recollect whether he was there when I went down, and I cannot exactly say what he came for. I am not aware that any one else was there. Mr. Swain was there just before Wray came down. He came just after I got there. I do not recollect saying that Vinson was there; I do not remember seeing him. I am quite sure that no one was in the basement when Bicknell came down. Vinson and Swain are here; Binfield is dead. I should think the explosion took place about twenty minutes to eleven. The gas at the meter had not been turned on till I did it, and there was no light in any part of the place.

By the COURT: I saw that the meter had not been turned on.

By Mr. LUSH: I only know of two meters being on the premises. When I came out after the explosion, the flames were going into the basement; I swear that they did. I did not observe the hole at the time, because the place was one body of flame. The fire was going through the hole into the basement. I did not see it coming out of the basement through the hole in the wall. I will not swear that it was not. It was about twenty minutes past ten when I first smelt the gas in the basement. I turned all the burners down, except one in the closet, before I went up into the ground floor; it was my duty to do so. It was Jeffrey's duty to light the gas on the ground floor.

Re-examined by Mr. HAWKINS: When I turned the burners down, I still saw the gas was alight, so that none could escape. When I turned the gas on at the meter that morning, I had to turn it quite as much as I always did, so that I know it was turned off safely before. I had to turn the taps of the burners as usual before I could light them. The flame that I saw going into the house, after the explosion, was one continuous flame from the main in the street. It did not stop at the wall of the house.

Samuel Bugg, examined by Mr. HAWKINS.

I was not examined at the last trial. In February, 1860, I was a porter in the service of Mr. Morley. I am now in the employ of White, Keen, and Co. I remember the morning of the fire. I arrived at the premises in Wood Street about a quarter to eight o'clock. I went, first of all, up into the kitchen to get my breakfast, and afterwards into the ground floor and the basement. There was then no smell of gas in any part of the premises. It was my duty to clean out the counting-house, and I went into the basement to get a broom for the purpose. There was an offensive smell from the water-closet, which was always the case after the premises had been closed for twenty-four hours. There were many goods in the basement at that time. When I went down, I opened the windows over the pavement—the top windows of the two, through which goods were sent down the slide. That was a few minutes before eight o'clock. I was not often in the habit of doing so; I did it sometimes. I opened them that morning on account of the stench. After I had done so, I found the smell from the water-closets went off. I left that part of the premises——

Lord Chief Justice COCKBURN: Then you do not know anything about whether the smell went off, if you went away when you had done that.

By Mr. HAWKINS: When I had finished what I had to do, I took the broom back again, and the smell was better then. There was no smell of gas at that time. It was part of my duty to fetch the chaise from the livery stables, for the town traveller. When I left the warehouse for the chaise, about nine o'clock, I saw two men outside, getting a flag-stone up in front of the place. When I came back, the men were engaged in making a trench. I asked them what they were doing, and they said they were going to put a larger main there. When I got into the warehouse, I did not smell any smell of gas. I remained at the door looking at the men for nearly an hour, while I was attending to the trap, as the town traveller was late. I left before the men had made the hole in the pipe. They had begun to make a hole in the wall, and had got about a brick and a half out. The trench or hole in the pavement was then made up to the wall of the house. I went away with the traveller before the explosion took place. We went into Union Street, in the Borough, and when we got there it was about a quarter to eleven by the church clock. We had driven over there at about the ordinary pace.

Cross-examined by Mr. BOVILL: I was not examined at the inquest, or at the last trial. I left Mr. Morley's employment about twelve months ago. I cannot say when it was I first mentioned about opening those windows. It was about three or four months ago. I did not open the iron bars. I had opened those windows before, but it was not my practice to do so. One side of the window below was open when I went there, and I opened the one above. I believe it was very cold weather then. It was the duty of the party who had to get goods in to open the iron grating outside the window. It was no part of my duty to open the doors or the windows. I recollect doing it on that morning. I always went down to fetch the broom every morning, and I should at any time have opened the window if there had been a particular smell. The fact of the fire caused me to remember that I did it that morning. A gentleman came to me about four months ago, to ask about it. It was Mr. Loxley. He is a lawyer, I believe. I do not know whether he is the lawyer of one of the insurance offices. There was a party that told him about it. His name is John; he is in Mr. Sturgeon's employ. We talked about it in the street, but I did not send a message by him. I do not recollect whether he told me that he was at the last trial; I cannot say, one way or the other.

Mr. BOVILL: Did he tell you what he had got?

Witness: What he had got? I could see what he had got.

Mr. BOVILL: Well—what?

Witness: A parcel. (Laughter.)

Mr. BOVILL: Did he tell you what money he had got for attending the trial?

Witness: No, sir.

Cross-examination continued: It was a few weeks after I saw him that Mr. Loxley came to me. When I met John in the street, we were talking about the fire. That was about three or four months ago. I do not see him more than once in three or four months. We were only in conversation a few minutes. I do not recollect what I said to him. I did not say I should like to come as a witness. He asked me whether the doors were open.

By the COURT: I do not know whether that man was Vinson. I do not know his other name. I can point him out. [Witness pointed to the person, who was in court, and who said, in answer to a question, that his name was George Jordan.]

Lord Chief Justice COCKBURN: Although the fire took place a long time ago, the trial came on about the time witness speaks of, and, therefore, they might be talking about it.

Witness: That was how we came to talk of the windows being open. I told him the doors were open. I said I had opened them.

Frederic Jackson Wray, examined by Mr. KARSLAKE.

I was in the employ of Messrs. Morley in February, 1860, and slept in the house. I was in the warehouse on the morning of the fire. About half-past eight o'clock I went up to the top of the house to the print room in the rear, where I usually worked. About nine o'clock I returned to the ground floor, and brought down some prints to put in the window. I then saw the gas company's men outside with a truck; they had just arrived. I was at the window about a quarter of an hour, during which time they had begun taking up one of the flags of the pavement, and digging a trench. I said something to Binfield, and he went out and looked at it. I was afterwards engaged in carrying goods upstairs from ten to a quarter past, and then went out to the Cross Keys to have something to drink. In doing so, I did not pass the men who were at work. Upon returning, I went into the basement floor. Up to that time, I had perceived no smell of gas that morning. I went down to the closet which was next to the meter, and I then observed that the men had made a hole in the wall round the former gas service belonging to the Chartered Company. There was nothing in that hole to stop it up. The model correctly shows the place where the meter was at the time. While I was inside the closet, I could hear the men knocking outside, as they were at work in the hole, and the dust fell about me at the time. I then smelt a strong smell of gas. It was not so strong when I first went in. I scarcely noticed it in the basement before hand. While I was there, it became so offensive that I was obliged to hurry away as quickly as possible; in fact, I was rather frightened to stop. When I came out, Locke was in the basement, and I made some observation to him. Mr. Glanville, who was in Morley's employ, called me up into the warehouse, and I went into the print room at the top of the house. By the time I got there, I heard a great noise upon the stairs like the smashing of glass, and a loud report; I then came down again to the ground floor, and found there was a large hole just in front of the window, so as to bar all egress. Upon that, I and several others rushed up to the top of the house, and made our escape by the skylight. The goods were then burning, and we got some away from the front. It was about a minute to a minute and a half from the time I left the closet to the time when I heard the crash. I left England in September last to join Garibaldi's army, and returned about the 10th of January.

Cross-examined by Mr. LUSH: My attention was not called to this trial till after my return. When I first saw the men at work, they had taken up the flagstone. I did not notice where they had put it, when I went to the Cross Keys.

Mr. *Henry Glanville*, examined by Mr. POLLOCK.

I am a warehouseman at Morley's. I remember on the morning of the fire going down two stairs to call Wray, as I wanted him in the print room. That was about half-past ten. I then smelt the gas very strongly. I told Wray I thought the place would be blown up with the gas. He said, "It is all right; the gas-men are here." I then went out into the street, and had gone about a stone's throw towards the church in Gresham Street, when I saw some people running up Wood Street, and heard some one calling out "Fire!" I went back, and saw that Morley's place was in flames, within the window. I could not see the basement and the trench at that time, as there were a number of persons collected round it. I tried to go in at the front door, but could not. I saw the trench about a quarter of an hour afterwards. The place was then blown down, and there was a pipe going in from the road towards the cellar. I saw a part of the wall towards which the pipe went; the top part of the wall was gone.

Cross-examined by Mr. KEANE: I did not make any memorandum of this. I was first applied to, to come here about two months ago. Mr. Loxley asked me at that time whether I knew anything about the fire?

By the COURT: I had been upstairs from about nine o'clock. Until I came down to call Wray, I had not smelt any smell of gas whatever.

Mr. *Thomas Lowden*, examined by Mr. HOLLAND.

I was a warehouseman at Messrs. Morley's at the time of the fire. I went to the premises about half-past eight that morning, and went directly through the warehouse up to the first floor. I remained there a few minutes, and then went down into the basement to the slide. There was no smell of gas at that time. I went out at ten o'clock, and returned in half an hour, about five minutes before the explosion. As I went in, I observed the men at work in the street. They had taken up the stone, and were digging the trench. I went into the warehouse; but, smelling the gas just at the doorway, I returned. I spoke to one of the men outside. I said, "Mind you don't blow us up, old fellow!" and he replied "All right." I did not notice the trench they had dug. I am sure that the first time I smelt the gas was as I was going into the door of the warehouse. After speaking to the men, I went up into the print room, and saw Mr. Frotwell, who is a manufacturer's agent, and showed him a sample of stuff. About a minute elapsed, when he left me, and I went down stairs. When I was within a few yards of the door, the explosion took place. I did not hear more than one explosion. I cannot tell what happened after the explosion. The first thing I recollect was, that the floor was blown up, and my legs were hanging through the hole. One of the porters dragged me out. The flames were coming up through the floor. My legs and arms were both burnt.

Cross-examined by Mr. BOVILL: The floor appeared to me to be blown up from below. The explosion was underneath the ground floor. Where I first smelt the gas was two or three feet inside the front door of the warehouse.

WEDNESDAY, JULY 3.

Mr. *John Vinson*, examined by Mr. KARSLAKE.

On the morning of the fire, I got to Messrs. Morley's premises about ten minutes to nine o'clock. As I went in, I observed the men at work in front, taking up the paving-stone. I went out again at ten o'clock. There was no smell of gas in the premises then. I stood at the door about ten minutes, watching the men. The trench was then open from the main to the house. I observed that one or two bricks had been taken out of the wall at the bottom of the trench. The earth that had been taken out was lying about, and there was a slight smell of gas from it. I said to Bicknell that it smelt strong, and he said it did.

By the COURT: I am sure there was no smell of gas in the inside of the premises at that time.

By Mr. KARSLAKE: I then went into Cheapside, and returned in about twenty minutes. The men were still at work. One was cutting the pipe, and the other appeared to be looking on. The man who was cutting used a hammer and chisel. I did not see any other instrument there. I just looked in at the door of the warehouse, and then went into Mitre Court. As I came back, in five or six minutes, I heard the explosion, and saw a flame coming from the pipe which the men had been cutting. I was on the opposite side of the way when I heard the explosion. The flame went towards the house. The front windows were broken, and the place was all on fire. I went to the front door, and tried to open it, and could not, in consequence of the cellar having been blown up. I did not see any flame coming out of the house into the street.

Cross-examined by Mr. BOVILL: I was examined on the two former occasions. I was in the warehouse when I first smelt the gas, near to the staircase going up from the basement.

Lord Chief Justice COCKBURN: I have got your evidence wrong, then. I thought you said you smelt no smell of gas in the house.

Witness: I smelt a very slight smell of gas; I had seen the men at work.

Lord Chief Justice COCKBURN read his notes of the witness's evidence in his examination in chief on this point.

Mr. BOVILL said the question was put to the witness three or four times on the last occasion, as to where he first smelt the gas, and his evidence then was to the effect that it was when he was on the ground floor, close to the bottom of the stairs leading to the first floor.

A conversation arose on the apparent discrepancy between the evidence now given as compared with that given at the last trial, and the witness pointed out on the model the position he was in at the time he first smelt the gas.

Cross-examination continued: I cannot say that I did mention one word at the last trial, or before the coroner, as to the smell of gas from the earth. I heard your address to the jury; but, I do not remember your making some strong observations about my having smelt the gas at that spot.

Lord Chief Justice COCKBURN: I am bound to state that, he said exactly what he now says in his cross-examination.

Mr. BOVILL: I admit that, my lord; but in his examination in chief he said he smelt it at the front door, but I have now got it that he smelt it before he went there. (To witness:) When you were first asked about smelling the gas by my learned friend, how came you to say it was near the door while watching the men? Why did you not say it was in the warehouse?

Witness: I smelt the gas very strong at the door. I have no other explanation to offer.

Lord Chief Justice COCKBURN: I suppose that must be the case. I never knew the earth taken up where there are gas-pipes without there being a smell. The man must be right about that.

Mr. BOVILL: My lord, I am not disputing that he did smell it; but your lordship did not hear the question. In his examination in chief he said he was at the door watching the men when he first smelt it. But he volunteers the statement that it was when he was in the warehouse. There was not a word said about the smell from the earth on the last occasion.

Cross-examination continued: It was about thirty minutes from the time I first smelt the gas, until the explosion occurred. I do not know whether there were any burners alight on the ground floor that morning. When I went out to Cheapside the men were chipping the pipe, and when I came back they were paring it. The hole was not burst through, when I went out. When I came back, it was made. That I saw with my own eyes. It was two or three minutes after I returned before I went to Mitre Court. I

remained that time at the door, and saw the men paring the main. The service-pipe was not fitted into it; the hole was made so as to enable it to be done. I cannot say whether I said one word about this on the last occasion, or before the coroner.

Lord Chief Justice COCKBURN: He would not say it to-day unless you asked him. It very often happens that a question is not put on cross-examination, and then it does not appear in the evidence.

Mr. BOVILL: That is very true, but the other question was asked him.

Cross-examination continued: It was Bicknell who was paring the pipe. Allen was standing close to him looking on, with his back to the window. Bicknell was stooping down with his hammer and chisel at the hole, and Allen was between him and the house. The earth from the trench was thrown out and lying about.

Re-examined by Mr. KARSLAKE: I cannot say that during the two or three minutes I saw him, Bicknell was always in the same place. [Witness described on the model the spot where he first smelt the gas.] I came back from Cheapside in consequence of a message that some one wanted to see me, and I looked in at the warehouse to see if some one was waiting for me.

By the COURT: I first smelt the gas coming from the back of the warehouse to the front door. When I got into the lobby, the smell was stronger.

Mr. *John Fretwell*, examined by Mr. POLLOCK.

I am a warehouseman in Goldsmith Street, which is a turning out of Wood Street. On the morning of the fire, I had occasion to call at Mr. Morley's warehouse shortly before the explosion. I went in at the front door, and passed up to the first floor. On entering the premises, I smelt a slight smell of gas. The time was half-past ten, or a little later: I did not notice any smell of gas on the first floor. I was about five or six minutes there; my object in going was to sell some goods. I returned the same way, and the smell of gas was then almost suffocating.

By the COURT: I first found that suffocating smell in the front of the warehouse, coming from this side of the door, [pointing to model.]

Mr. BOVILL: That is near the stairs?

Witness: Not near the stairs which I had come down, and which were beyond the spot shown on the model. I smelt the gas very much worse, when I got nearly opposite the stairs leading from the cellar.

Lord Chief Justice COCKBURN: Which smell was not there at the time you entered?

Witness: No.

By Mr. POLLOCK: As I passed out of the premises, I saw some men at work in a trench; one of them was stooping over a pipe in the trench. I remarked to them that they were poisoning the people inside. I then went on towards my own warehouse. When I got to my own door, which is about 65 yards from Mr. Morley's, I heard the explosion, and I immediately remarked that it was at Keene's. I went back, and the fire was then coming through the front windows.

Cross-examined by Mr. BOVILL: I do not think I smelt the gas at all on the stairs; I do not recollect noticing it. I do not remember being asked the question in the former trial and replying I did not know whether I smelt it on the stairs. If I did smell it, it must have been very slight. I certainly did not find it much worse when I first got inside the premises.

Re-examined by Mr. KARSLAKE: It was when I was coming out, and had reached the stairs leading to the basement that I smelt the gas overbearingly strong.

By the COURT: I passed that spot as I went in, and there was not that smell then.

Mr. *W. Shepherd*, examined by Mr. HOLLAND.

I was a warehouseman in the employment of Messrs. Morley at the time of the fire. I got to the premises about ten o'clock that morning. As I went in, I saw two men at work outside the house; they were throwing out the earth from a trench. I did not notice whether both of them were engaged at it. I had a small desk in the front window, and I went to it at once. I did not perceive any smell of gas then. I remained there about five minutes, and then went to assist in opening some bales about the centre of the warehouse, on the ground floor. I was employed at that nearly up to the time of the explosion. It was about half-past ten when I first perceived any smell of gas. I was then at my desk close to the doorway. The smell was very strong, and it increased while I was sitting there. I remember Mr. Fretwell, the last witness, coming in, and also Mr. Upward, of the Chartered Gas Company, a few minutes before the explosion. I went with him to the staircase leading up to the print room, which was beyond the part shown in the model. As I was returning to my desk, I heard an explosion. I heard only one. I then saw the flames in the front part of the premises. I did not go near enough to see where they came up from. I was almost choked and knocked down. I escaped at the door of the house. There were two water-closets in the basement; one was lighted by a gas jet. That is the one nearest the meter. The other was lighted by an open grating with a glass underneath, which also opened.

Lord Chief Justice COCKBURN: I do not know whether anything turns upon this.

Mr. KARSLAKE: It may, my lord.

Mr. BOVILL: We never heard anything about it before.

Lord Chief Justice COCKBURN: If anything turns upon it, I will take a note of it.

Examination continued: That is not the grating which has been already spoken about; it is the door-way grating. The window was generally kept open.

Cross-examined by Mr. BOVILL: As near as I can tell, it was half-past ten when Mr. Upward came in; it was just as Mr. Fretwell went out, and a few minutes before the explosion. He did not wait to talk to me, but went up to see Mr. Morley. I showed him to the foot of the staircase, and then returned to my desk. It would not be more than a minute.

Re-examined by Mr. KARSLAKE: I have looked carefully at the model; it correctly represents that part of the premises it professes to show.

Mr. *Robert Atkinson*, examined by Mr. KARSLAKE.

At the time the fire took place, I was in the employ of Messrs. Edgcombe, Sturgeon, and Pencocke, whose premises were next door to those of Mr. Morley. On that morning I was engaged in the basement, which was lighted with gas supplied by the Great Central Company. About half past ten o'clock, the lights went out several times—in fact, we could not keep them in. I lit them four or five times; and, as fast as I lit them, they went out. Three or four minutes after I first relit them I heard the explosion; it was very heavy. I then went out and found that Messrs. Morley's premises were on fire. I observed the trench that had been cut by the men, and saw there was fire in the trench. I could not account in any way for our gas going out.

George Jordan, examined by Mr. HOLLAND.

I am a packer in the employment of the present plaintiffs, and was so in February, 1860. On the morning of the fire, I was engaged at one time in the packing-room, which is in the front of the basement, and is lighted with gas. The gas did not go out while I was there. When I had finished my work, I went into the entering-room, which is at the back of the basement. While I was there, the gas went out once; that was about twenty or twenty-five minutes past ten. It did not go out more than once—it flickered. From the entering-room I went into the counting-house on the first floor, and was there about three minutes; I then returned to the entering-room, and the gas was all out. I went into the street and saw two men at work in front of Messrs. Morley's—one of them was in the trench. I spoke to the men, and said, "How long shall we be without gas?" One of them showed me a kind of plug and said, "As soon as we have fixed this in here," pointing to a hole in the main-pipe.

Mr. HOLLAND: Did you observe the premises—the front of the house of Messrs. Morley—at that time?

Witness: I did not take particular notice of the front of the premises.

Mr. HOLLAND: Had you done so in the morning?

Witness: No.

Examination continued: About half a minnte after I had returned into the plaintiffs premises, I heard the explosion. I then went back into the street, and saw a body of fire running from the hole which the man had previously pointed out to me. I did not hear more than one explosion. I know the windows in Messrs. Morley's premises above the grating in the pavement. When I went out to speak to the men, I noticed that the windows were open.

Mr. BOVILL: About two minutes ago, did you not say this in answer to my friend, "I did not take any notice of the front of the premises"?

Witness: I said "not the house."

Mr. BOVILL: Now, then you mean to swear you did take particular notice of the windows?

Witness: Yes, I did.

Cross-examination continued: I did not attend the inquest; I never heard of it. I was not present at the former trial; I did not hear of it until it was over. It was immediately after the fire or about the time of the fire that I first said anything to any one about having noticed the window.

Mr. BOVILL: Who did you mention it to?

Witness: No one of any consequence. I mentioned it as an incident of the fire to my friends and the fireman. I know I did notice it; but I cannot say who to. I do not know whether they were the firemen of the Phœnix Office; they were the firemen sitting up with me. I mentioned it often. I did not mention it to Morley's people; I so seldom see them. I did not tell Blenkiron's people of it. It was not at the public-house that I talked about it to the fireman at the warehouse. I do not know his name. I did not say anything about the lower window through the grating. I believe there was not anything against the iron bars in front of the windows. There was not a flagstone or anything like that.

Mr. BOVILL: When I asked you whether there was anything or not in front of the windows, why should you say there was not a flagstone?

Witness: There was not anything so conspicuous.

Mr. BOVILL: Why do you throw in a flagstone?

Witness: Because I should have seen that; it would have stood at the side.

Mr. BOVILL: Was it standing at the side?

Witness: No; there was nothing like it.

Mr. BOVILL: Then, how came you to introduce it? You might as well have said a haystack.

Witness: Because there was nothing like a flagstone.

Mr. BOVILL: Now, will you, upon your oath, swear positively that there was not a flagstone against the iron bars?

Witness: Yes.

Mr. BOVILL: You will swear that just as positively as that you noticed the windows?

Witness: Yes.

Mr. BOVILL: And one is as true as the other?

Witness: Yes.

Cross-examination continued: I have never talked about a flagstone being there; it has never been mentioned in conversation that there was; and it has never been suggested to me.

Mr. BOVILL: Then, now I ask you again, why you introduced for the first time that there was not a flagstone there?

Witness: Because you asked me if there was anything standing up against the windows, and I said not a flagstone, nor anything like a flagstone.

Re-examined by Mr. KARSLAKE: I have known Messrs. Morley's premises for some time, and have often observed the doors opening into the street. We had similar doors at our premises.

Lord Chief Justice COCKBURN: Now, just attend to me for a moment. You say you saw the window open?

Witness: Yes.

Lord Chief Justice COCKBURN: Where were you standing at the plaintiff's warehouse—on which side was it?

Witness: On that side [pointing to the model]—the north side.

Lord Chief Justice COCKBURN: You were standing in front of the window, and the men were in the trench?

Witness: Yes.

Lord Chief Justice COCKBURN: Where the men were, could they see that the window was open?

Witness: They could see it, but not in the position they were in when I saw them.

Lord Chief Justice COCKBURN: You mean that, in the position in which they were when you saw them, they could not see it.

Witness: No; because one man had his back to it, and the other man, I do not know where he was.

Lord Chief Justice COCKBURN: Was he standing up?

Witness: The man in the trench? I cannot say.

Lord Chief Justice COCKBURN: And you could see that the window was open?

Witness: Yes.

Lord Chief Justice COCKBURN: But, whether they could see it you do not know?

Witness: No.

Mr. *W. Green*, examined by Mr. HAWKINS.

I am a warehouseman, in the employment of Messrs. Sturgeon. I remember being at the premises on the morning of the 27th of February, which was the morning of the fire. I arrived there at half-past eight, and went straight into the warehouse on the ground floor, as I generally did. I was down in the basement sometime between half-past eight and nine. There was not any smell of gas there at that time. When I arrived that morning, I saw two men, with a truck, standing in front of Messrs. Morley's premises. At that time, the pavement had not been taken up. I remained in the warehouse till half-past nine or twenty minutes to ten. I then left

to attend to my business out of doors. I observed that there was a hole made in the pavement, about the size of one flagstone, extending up to the front of the wall of the house. I passed over the trench. I cannot tell whether a hole had been then cut in the wall. I know the bars which communicated with a slide opening on to the pavement at Messrs. Morley's. They were open at that time, and the window behind the bars was open also. Just at the moment I was about stepping over the hole, a man was coming up from the basement of Messrs. Morley's premises on to the pavement. He came through the window. That was between half-past nine and twenty minutes to ten. I could not say for a few minutes. I was absent about an hour. I did not observe the trench on my return. As I entered our own warehouse, I smelt the gas. It was rather strong, but not what I should call very strong. It was an offensive smell. I left the warehouse again about twenty minutes to eleven, and again passed the trench. One of the men was then stooping down over the trench, and apparently doing something, but I did not stop to observe what. I smelt the gas as I passed. It was then rather strong, but not what I should call very strong, because that would be almost suffocating. One of the men was then standing with his back to the front of Messrs. Morley's premises, apparently looking at the other. As I passed, I observed a light in the basement of Messrs. Morley's premises. It caught my eye as I passed. I saw the light distinctly.

Lord Chief Justice COCKBURN: You mean, the light of the gas.

Witness: It might have been a candle or gas.

Examination continued: I saw a burner. I could not say whether the doors were open or shut at the time.

By the COURT: By the bars, I mean those front gratings.

Cross-examined by Mr. LUSH: Those bars were, very likely, open frequently to let in goods. The man I saw coming up from the basement, through the window, was one of the gas-men who were employed—one of the two I saw outside. I did not observe whether he had anything in his hand. I will not swear which of the men it was, as I did not take sufficient notice of them. I believe it was the tallest of the two. He was just coming up from below to the front. I had not noticed the windows that morning before. I was not examined at the inquest, nor at the last trial. I have been employed at Messrs. Sturgeon's ever since. I first mentioned the circumstance of my seeing this man coming up out of the basement about nine or ten months ago. I do not know whether that was before the last trial or not. I was asked the question by a gentleman from Messrs. Dawes and Sons. I do not know whether they are the solicitors for the Phœnix fire office.

Mr. HAWKINS: They are the solicitors for the plaintiffs.

Cross-examination continued: Before that, I had not mentioned it to anybody. I had heard there was an inquest, but, up to that time, I am not aware whether I mentioned it to anybody or not. As I passed over the trench, I believe the curb-stone was in the space between the two houses. I believe it was leaning against the wall of the house, but I did not take particular notice.

Thomas Waters, examined by Mr. KARSLAKE.

I was an assistant-clerk to Messrs. Sturgeon at the time this fire broke out. I was in the basement some little time before I heard the explosion, at the end furthest from the street. I went to business that morning at half-past eight. Directly I came, I noticed the truck outside. While I was in the basement that morning, I observed the gas flicker and go out. I lit it again two or three times, but could not keep it in. A few minutes after that, I smelt a smell of gas, and then I heard the explosion. It was not very loud. Soon after that, the premises were all on fire.

Cross-examined by Mr. KEANE: I did not go out again after I saw the truck.

Mr. *Alfred Upward*, examined by Mr. KARSLAKE.

I am a civil engineer, and superintendent of the Brick Lane and Curtain Road stations of the Chartered Gas Company. I have been for twenty years connected with that company. On the morning of Monday, the 27th of February, 1860, it came to my ears that a change was going to be made in the supply of gas to Messrs. Morley's premises. In consequence of that, I went down to see Mr. Morley on the subject. As I passed along the street, going to their house, about half-past ten, I observed the Great Central Company's men at work at a 3-inch main in the footway. The company's truck was standing by the side of them. I spoke to the men, and asked them what they were doing? They told me they were going to lay on the gas from their main to Messrs. Morley's premises. At that time, the trench was open, and the 3-inch main of that company was exposed. That main runs along the pavement parallel to the house. They had cut a hole at the side of the main facing the house to insert the service-pipe. I observed that there was a large hole, sufficiently so, I should imagine, to take an inch and a half service. I observed the wall of the house at the end of the trench; it had apparently been fresh cut; the bricks were cleanly broken. There was nothing that I could see that would indicate that the hole was closely stopped inside. The men were using either the tap or the rymer. I was with the men a very short time; I simply asked them what they were doing, and then looked down through the grating which communicates with the basement.

By the COURT: The bars were not open; the window behind them was; I looked through it.

By Mr. KARSLAKE: Immediately after doing that, I went into the warehouse. My object was to see Mr. Morley. I spoke to one of the clerks, who took me to a staircase and then left me, telling me to go upstairs, and I should find Mr. Morley on the first floor. I went up the stairs; but, before I could get to the top, the explosion took place. I was then only up a few steps. Upon hearing the explosion, I ran to make my escape by the door at which I had entered; but the flames prevented me doing so. The flames were issuing up apparently from the bottom; it was one sheet of flame. Finding myself stopped there, I and others made our escape through the skylight at the top of the house; and we had some difficulty in getting a ladder long enough. After stopping and endeavouring to pull up a few who remained after me, I made my way down the stairs of the next house, and at once went into Wood Street. I saw the place where the trench was dug. I cannot say that at the time I saw the Chartered Company's pipe exposed; but I did afterwards, because we stripped it to cap it. Our service-pipe was lying in the same trench. Our main is somewhere about the middle of the street. After I made my escape, I saw a flame issuing from this 3-inch main of the defendants into the house.

Lord Chief Justice COCKBURN: Did it find its way through the hole in the wall into the house?

Witness: I saw a corresponding flame through the hole inside the premises.

Lord Chief Justice COCKBURN: Then the hole was open—was it?

Witness: I imagine it was open; it must have been open at that time.

By Mr. KARSLAKE: The jet of flame was going into the house from the main which had been cut. From the way in which it was coming into the house, I should say there was considerable pressure in the main. I should not say that the hole in the wall of the house was any larger then than when I saw it before; I did not see any alteration in it.

Mr. KARSLAKE: Did you see what state your own meter was in, at the time you first saw the flame coming through the hole in the wall?

Witness: Yes.

Mr. KARSLAKE: Was it at that time consumed?

Witness: No.

Lord Chief Justice COCKBURN: You mean when you looked through?

Witness: Yes; When I looked through. After I had made my escape through the next house, I passed down and looked through the grating where I knew our meter was.

Lord Chief Justice COCKBURN: Could you see your meter?

Witness: I saw our meter then; it was not consumed; it was not burning.

Lord Chief Justice COCKBURN: By that, do you mean it was red hot?

Witness: It was not on fire; it was a tin meter; and it would, therefore, only take a few minutes to melt it.

Mr. KARSLAKE: Was your meter shortly after burnt so as to let the gas escape?

Witness: Yes; and our service took fire.

By the COURT: I cannot positively swear how long afterwards, but a very short time. It was a dry meter. It might be five or ten minutes afterwards. I first put out the flame from the Central main before I noticed our meter was melted.

By Mr. KARSLAKE: Having put that out, I found there was flame issuing from our pipe, when I went back to see our meter. The flame was issuing from the bend downwards. After awhile, one of our men went down, and plugged it with a piece of clay.

Mr. KARSLAKE: I will just ask you a question about the practice of laying service-pipes.

Lord Chief Justice COCKBURN: Are you going upon that again? I thought it was thoroughly worked out. I considered the explanation was satisfactory. It is no use making false points. Unless you are prepared to strengthen your case very materially, it is no use going into it. I thought the evidence was overwhelming.

Mr. HAWKINS: We have a vast body of evidence upon it.

Lord Chief Justice COCKBURN: I only speak from what took place last time. I thought you made a false point.

Mr. HAWKINS: We are going to show a variety of modes by which the thing may be done.

Lord Chief Justice COCKBURN: The only question is, whether the mode adopted in this case actually amounted to negligence? That is the only way in which it has any relevancy. It may be that you presented your case very weakly last time, and may be prepared to strengthen it now; but, if it is the same evidence, it is no use going into it.

Mr. KARSLAKE (to witness): With reference to putting on a service, what is the ordinary mode of doing it?

Witness: Considering that the main was so near the house, and the service was so large, I should certainly have bladdered off.

Lord Chief Justice COCKBURN: You say you should have done it—the question is, what is the course usually adopted?

Witness: There are many courses. Simply putting in the service is one course; but that is a dangerous one so near the house, and with openings communicating into that house such as these.

Lord Chief Justice COCKBURN: You are speaking of this house specially. You consider in dangerous, considering the particular openings?

Witness: Yes. If there were no openings, and the gas had no chance of getting into the house, there would be no actual hindrance.

By Mr. KARSLAKE: Simply putting in the service is a very ordinary course. That is done by first cutting the main with a chisel, and then using the rymer and tap to get the screw.

Lord Chief Justice COCKBURN: In that case, you adopt no protective means at all?

Witness: Not in that case. The next mode is to take a small piece of pipe, called a connector, with a plug at one end. That is screwed into the hole made into the main, and there left for the present. The next duty of the man is to cut a hole through the wall of the house into the premises, and to pass through a sufficient length of pipe to meet the connector. That piece of pipe, at the extremity in the house, is provided with a cock, which, of course, ought to be closed. He then screws the two together by means of a running socket, one half of which screws on to the connector, and the other half on the pipe. The hole in the wall of the house ought not to be made until the connector in the main is made safe. There would be a considerable escape of gas during the process of cutting the hole in the main.

Mr. KARSLAKE: In practice, is there any mode of preventing or obviating, to some extent, the flow of gas?

Witness: Yes; by means of bladdering.

Lord Chief Justice COCKBURN: That brings us to another mode. If you bladder, you do not want the connector?

Witness: It does not follow that you must. You must make the connexion on to the T-piece.

Mr. KARSLAKE: Do you, in practice, at times when a main is near the house, use the bladder without using the T-piece?

Witness: I do not positively and actually attend to the laying of services, and therefore I think you had better ask those who do.

Mr. KARSLAKE: Just tell us how you use the bladder without the T-piece?

Witness: You simply cut a small hole at the top of the main, on each side of the place where the service is to be laid on, and insert empty bladders, which are then blown out, so as entirely to shut off the flow of gas to that part of the main where the service is to be placed. The advantage of this mode is, that it enables the supply of gas to be continued to the houses on either side during the time the operation is going on. I should say it is a well-known method.

Mr. KARSLAKE: You spoke, also, of using the bladders with a T-piece as a distinct process.

Witness: Yes; that is the way I should have done this job.

Lord Chief Justice COCKBURN: Then, the fourth mode is when you use a T-piece.

Mr. KARSLAKE: When you are using a T-piece, do you use bladders on each side, in the way you describe?

Witness: Yes, so as to cut the supply of gas off. The piece of main between them is cut out, and the T-piece is inserted, the tail of which forms a portion of the pipe to which the service is to be connected. [Witness explained the process by means of pieces of pipe, &c.] This is a perfectly safe mode of doing it, and we frequently adopt it where the supply of gas to the premises is large, and we should do so where the main was small

and near the house as in a narrow street. For a three-quarter inch service, we should not do so.

Examination continued: A one and a half-inch-service in a 3-inch main is a large one. It is the second largest size that we can put in. If the main were supplied only from one side, there is no necessity to bladder if the service is laid on the dead end. Our mains are chiefly supplied from both ends. They are generally connected at the crossings of the streets, so that we get a supply both ways. I believe that is the case with the Great Central mains; they are also connected by riders; that is to say they have a large main on one side of the street, and a small one on the other, or a large main in the centre, and a small one on either side, and they are connected by cross-riders. In cutting a main near the house, it would be safer to make the hole at the top, than at the side. In that case, we should have to put in a bend, which would be united to the connector, and we should then proceed as before. The pressure of the gas in the Great Central mains is much greater on Monday morning that at any other time, unless it comes on foggy, and that takes off the pressure.

Mr. KARSLAKE: You are the engineer of your company; do you issue any orders to your men when laying on services as to the lights?

Mr. BOVILL: I object to that.

Lord Chief Justice COCKBURN: It is not one instance, merely, I suppose. The object of this inquiry may be to show not only what they do, but that it is the uniform, or at all events the very general practice of gas companies, so as to lead to the inference that there is a departure from the general experience in this case?

Mr. BOVILL: But the question is as to the orders which he issues.

Lord Chief Justice COCKBURN: That is simply because he is the representative of his company. If it be the practice of this company as well as many others to do certain things, it will not depend upon this instance.

Mr. BOVILL: Then, let them call a person who is accustomed to laying on services, to say what is the practice.

Lord Chief Justice COCKBURN: This is only one instance, perhaps, of many. If there are no more, it comes to nothing.

Mr. BOVILL: But, if his men do not obey?

Lord Chief Justice COCKBURN: It is nothing, unless it is followed up with effect. I shall tell the jury that the mere issuing of the order is nothing, unless the order is obeyed. I think we must go by steps.

Mr. KARSLAKE: If my friend objects, he shall have the question withdrawn.

Cross-examined by Mr. BOVILL: Our company is in opposition to the Great Central Company—very strong opposition. That feeling is imparted to the officers in getting away consumers; it is a very strong feeling. The feeling does not increase; I hope it was always the same. I cannot say I hope it will always continue. My feeling has not increased since the last trial.

Mr. BOVILL: Has your evidence increased?

Witness: I believe certain questions have been put to me which were not put to me before.

Mr. BOVILL: Now, just a word about this T-piece—beginning with the latter part of your evidence. In the whole course of your experience, did you ever see a 3-inch main bladdered when a service was to be inserted in it?

Witness: I do not know that I have. I think I may go further, and say that I never did. I cannot recollect one.

Mr. BOVILL: Just let me call your attention to one of your answers on the last occasion.

Lord Chief Justice COCKBURN: Can you have it stronger? He says he never did.

Mr. BOVILL: I ask you, is it not the usual and ordinary course, where a service-pipe is inserted in a 3-inch main, not to bladder?

Witness: I am afraid it is.

Cross-examination continued: I was examined at the inquest, and at the last trial. I have taken no active part in the preparations for this inquiry whatever. I have seen two or three persons who have called upon me for the names of parties to whom to apply as witnesses, but I have refused to give them. I have not applied to any engineers to come and give evidence. I will go further, and say I have refused to give names. I think I was called on at the inquest to state, and did state, what, in my judgment, ought to have been done. Very likely I did not state, either at the inquest or at the last trial, that anything ought to have been done except bladdering the main. Very likely the question was not put to me.

Lord Chief Justice COCKBURN: Just answer the question.

Witness: I believe I did not.

Lord Chief Justice COCKBURN: There is no doubt about it.

Mr. BOVILL: Did you make any answer to my learned friend at the last trial, that anything ought to have been done except bladdering the main?

Witness: I believe not.

Lord Chief Justice COCKBURN: That was certainly so. The only thing that was spoken of as to the course which ought to be pursued was bladdering the main, and that was met by the body of evidence to which I have referred, that a main was never bladdered under the circumstances. That was the course of the evidence at the last trial.

Mr. BOVILL: When did these other matters occur to you?

Witness: They simply came out by being asked questions by the solicitors for the plaintiffs.

Cross-examination continued: I had no men at the premises of Messrs. Morley en the morning of the fire until after the explosion. I cannot positively swear as to how many services our company had to those premises. I believe there was only one, but there might have been two. I think there was only one meter. There were not, to my knowledge, two services close together, entering the front of the premises. When I first went there on the morning of the fire, I saw the brickwork knocked away. There was apparently a hole through the building; I did not look into it. I did not see anything through it. I do not remember seeing a light through it. It was but a few minutes after the explosion that my attention was called to the state of that hole. I had not noticed before the size of the hole particularly; I saw it was a largish hole for a service-pipe to go in at. I should say it was between six or seven inches square. I noticed it sufficiently to see that. I could not swear to an inch either way. I could not see then that it was through. [Witness pointed out by the model the position he was in when he spoke to the men.] The man I spoke to, I believe, was Bicknell; he was the man that was at work at the time. After I had spoken to them, I looked through the bars, to see if I could see our meter. I did not see the lights burning; I simply went with one object—to see our meter. I did see it. I do not sufficiently recollect whether, at the last trial, I said one word about the window being open. I am not aware that I said anything to the gentleman who conducted the last trial about it.

Mr. BOVILL: You have talked about its being dangerous and unsafe, and a number of other expressions, and yet you cannot tell me whether the lights were burning or not.

Witness: I did not notice; I did not look down the basement with the view of seeing whether the lights were burning or not.

Cross-examination continued: When I was talking to the men, I did not observe that no bladders were being used. I might have guessed there were none, because the hole was small—I mean the trench, which was just sufficiently large to lay the service. They had not opened sufficient ground to use bladders. I was talking to the men and looking in at the window perhaps a minute. It was not long, because I soon saw what I wanted.

Mr. BOVILL: You saw your rival going to supplant you, and you went into those premises without the slightest fear or apprehension whatever?

Witness: If I had thought there was any danger, I should not have walked in.

Lord Chief Justice COCKBURN: It did not occur to you that there was any danger?

Witness: No, my lord; it did not.

Mr. BOVILL: You went into the premises without the slightest apprehension of any sort or kind upon your mind?

Witness: I have told you that I did. I neither thought I was going to be burned, nor blown up.

Cross-examination continued: I remember Mr. M'Lellan, or some one connected with the Consumers Company coming to me after the explosion, and while the fire was burning. I do not recollect saying to him, "You have been tapping a 2-inch pipe into a 3-inch main." I cannot swear whether I said that to him or not. I have no recollection of his correcting me, and saying it was nothing of the sort, and calling my attention to its being only an inch and a half service. It might have occurred. I will not swear it did not. It was not till some considerable time afterwards, that he called my attention to the fact that there were two sets of flame issuing from two services of our company. At that time, the Central Company's pipe had been stopped. I stopped that almost directly after I saw the flame issuing into the house: one of the Messrs. Morley assisted to put it out. The hole in the wall was immediately adjoining, and over our service; it was apparently the same hole. That was one of the places close to where M'Lellan called my attention to the flame issuing from our service. The flame issued from the end of the service where it had been connected with the meter by means of the lead pipe. I swear that I saw the flame issuing from the Great Central Company's 3-inch main, when I came into the street after the explosion, up to the house, and I saw a corresponding flame in the house. Of course, I could not see through the brick wall, but I could see that the corresponding end of the flame was on the other side of that wall in the premises. The tendency of gas as it comes out of a hole in a pipe is to rise. It depends upon the pressure, which may be one or two or three inches, which will force it downwards to a certain extent, and make it take a curve.

By the COURT: The flame that I saw in the premises was in the same line as the one issuing from the Great Central main outside.

Mr. BOVILL: You were asked on the last occasion, by my lord, whether, supposing after the explosion your service-pipe had been severed from the meter, it might not have produced the appearance you name, and you said it might. Do you say the same now?

Witness: No doubt, it would?

Lord Chief Justice COCKBURN: Would it be in the same line?

Witness: Very nearly, my lord. But, then, I could see the end of our service, and it did not take fire for some minutes afterwards.

Mr. BOVILL: You swear that you could see the end of your service?

Witness: I swear that I could see the meter, and our service was connected to that meter. It was not until I had put out the flame from the Central main, that the fire issued from ours.

Lord Chief Justice COCKBURN: Do you say that they were both unconsumed at that time?

Witness: Yes; the Chartered Company's meter was not then burning, nor the service that I could see. I saw the end of it connected with the meter.

Mr. BOVILL: Supposing it to be disconnected at the meter, would not the flame have presented the appearance you saw?

Witness: Yes; if our service had been broken in that hole, it would.

Mr. BOVILL: Are you prepared to swear that it was not broken?

Witness: I could not swear one way or the other.

Mr. BOVILL: Then, not being able to swear one way or the other, you are not able to say whether the flame you saw was from the Central or from your service?

Witness: No, I am not.

Lord Chief Justice COCKBURN: Except by inference. There is also the fact that the meter was not disconnected.

Mr. BOVILL: If it had been disconnected where it entered the wall by the explosion, the appearance would have been the same, because the hole was immediately adjoining their service.

Witness: If our service-pipe had been broken, as Mr. Bovill suggests, the gas went from our main straight into the building. But then, I swear that afterwards, when I had put the flame from the Great Central main out, I saw our gas alight downwards from the end of the service where the fire had burned the lead pipe away.

Cross-examination continued: I have seen a connector used in our company when laying on a service from a 3-inch main. We used to use a union, but that was expensive, because made of brass. I believe the connector is commonly used in putting in services. As I do not inspect every service that is laid, I will not swear that it is always used, but the instructions are to do so. It is a contrivance partly to avoid danger and partly for convenience in laying on the service. I saw these men using a rymer or chisel; I do not know whether they were using a connector or not. It would not have increased the danger in this case to use the connector and bring it immediately opposite the hole, because we plug up the hole, or cap it.

Re-examined by Mr. KARSLAKE: The connector ought to be plugged before it is put in the main, so that the moment it is inserted the escape of gas is prevented. We then fill up the hole in the wall, and put on the socket, having already put on a cock or tap at the other end of the service-pipe. I should say the men would not be using the connector when I saw them, because they had to tap the pipe. I saw our meter when I looked through the window after I made my escape from the house. The pipe which conducts the gas from the main to the meter is an iron one, and is attached to the meter by a short lead one. We carry the iron pipe as near to the meter as we can in practice. No part of our service was on fire when I first observed it. I might have seen the iron service-pipe which carried our gas into the premises after I had put out the flame from the Central main; I do not recollect whether I did. [Witness explained by reference to the model the position of the Chartered Company's service.]

By the COURT: The flame could not have issued from the service-pipe unless the connexion between it and the main had remained intact. When the lead pipe at the end near the meter became melted, the gas ignited, and burned in a flame downwards towards the floor.

By Mr. KARSLAKE: The flame which I saw issuing from the Great Central main passed into the house in a horizontal direction; the flame which I afterwards saw from our pipe was burning downwards. When I first went, I did not observe lights in the basement; I did not look for that purpose.

Mr. KARSLAKE: You say you do not know of a case in which, when a service was laid on a 3-inch main, the main was bladdered. Has it ever occurred to you to see a 1½-inch service laid on a 3-inch main?

Witness: It certainly may have been done. Our mains lie more in the centre of the road. When a main lies near a house, the position of the main increases the danger from an escape.

Lord Chief Justice COCKBURN: You looked into the basement to look at your meter—what did you want to look at your meter for?

Witness: I simply wanted to see where it was.

Lord Chief Justice COCKBURN: You did not know that?

Witness: No; not being the inspector, I simply wished to see if the meter was there, and then to persuade Mr. Morley that it was a pity to alter it. I did not observe the lights. I saw the men at work, and saw that they had no T-piece, and no bladder, and no connector. I had no reason to suppose they were using it. I really cannot say whether there were any lights or not.

Lord Chief Justice COCKBURN: You are familiar with the mode of putting services on mains—would it have produced any impression upon your mind if you had seen those lights?

Witness: Yes; I think I should have spoken to the men, though they were not our men.

Lord Chief Justice COCKBURN: That brings me to the point, whether or not you did see them?

Witness: I say I could not really swear—I should not like to swear whether I did see them or not.

Lord Chief Justice COCKBURN: Your impression would rather be, that you did not see them.

Witness: I think it would be, because I think I should have said, "There is a light near you."

Lord Chief Justice COCKBURN: You said nothing to them?

Witness: I said nothing to them.

Mr. KARSLAKE: How long afterwards was it when M'Lellan called your attention to it?

Witness: I should think a quarter of an hour or twenty minutes; it was some considerable time.

Edward Alfred Cowper, Esq., examined by Mr. HAWKINS.

I am a consulting engineer, of Great George Street, Westminster, and have been so for the last ten years. I have had a great deal of experience in mechanical engineering, and, amongst other things, in gas-works, though not so extensively in gas as many others.

Mr. HAWKINS: I am, first of all, going to direct your attention to the fact of a 1½-inch service being about to be connected with a 3-inch main. Can you tell us what modes there are by which all danger may be obviated?

Witness: Yes.

Lord Chief Justice COCKBURN: That does not relate to a 3-inch main, but to mains in general. Have you ever had to do with laying down mains?

Witness: Yes, my lord; I have had to lay down gas-works.

Mr. BOVILL: And service-pipes?

Witness: Not service-pipes—gas-mains.

Mr. HAWKINS: But you have become acquainted with the mode?

Witness: Yes. Shall we take a 3-inch main, or mains in general? Because, in large mains, it is almost universally the case to bladder.

Lord Chief Justice COCKBURN: I do not suppose it will be disputed that, with a large main, it is proper. The question is, whether it is done with a 3-inch main.

Witness: In laying a 1½-inch service on a 3-inch main, the proper course would be to bladder the main at one point if the supply of gas was from one end, and at two points if the supply were from both ends; and then to offer the T-piece against the pipe—measure it against the 3-inch main, and cut out such a length as would admit of the insertion of the T-piece. When the T-piece is inserted the bladders are withdrawn. Another mode is to bladder and drill a hole in the main without a T-piece; but, where so large a service as a 1½-inch is laid on to a 3-inch main, it is decidedly preferable to put in a T-piece, because so large a hole as it is necessary to drill weakens the main.

Lord Chief Justice COCKBURN: That is with a view to ulterior purposes,

Witness: Yes; with regard to danger also, because there is some danger of splitting the main. That is the reason why it is better to put in a T-piece, than to drill a hole. As I said before, the second best plan would be to bladder the main, and drill a hole. Another mode would be to bladder the main, and cut the hole with a chisel. A worse plan still would be, not to bladder at all, and the worst of all would be not to bladder, nor to drill, but to cut the hole with a chisel without any precaution. In fact, in most cases, the workman's time which would be occupied in bladdering is so little, that it would be paid for by the gas that actually escapes in cutting the hole without it. A thousand feet of gas may escape while that is being done, which is worth 3s. or 4s. [Witness explained the process of drilling.]

By Mr. KARSLAKE: Drilling is preferable to cutting, because it takes much less time to get a sufficiently round hole for the tap. The hole made by cutting is so rough, and so out of the round, that it requires a great deal of paring before you can get the tap to work, and it is utterly impossible to prevent a large quantity of gas escaping. I have known cases in which all these modes have been adopted. It would be better to cut the hole in the top than at the side of the main, because then the escape of gas would be upwards instead of towards the house. The gas issues from the hole with so much force that, if cut in the side of the main, it will pass horizontally, or nearly so, for several feet, the same as a jet of water issuing from a pipe under pressure. I have tried an experiment in order to prove this, and found that from 1¾-inch hole, the gas will go 4 feet before it rises 9 inches, and 5 or 6 feet more before it fairly turns up—that is with a pressure of 10-10ths, or 1 inch of water.

By the COURT: In its advance of 4 feet, it will rise 9 inches under this, which is the common pressure. With any extra pressure, it would pass much further.

By Mr. KARSLAKE: I have seen this experiment performed for the purpose of showing how far a jet of gas will be propelled. You will understand that I am speaking of gas passing horizontally without anything to guide it. If there were anything to guide it, it would pass much further. It is a fact that gas, unless mixed with air, will not burn at all; it requires a large quantity of air.

Lord Chief Justice COCKBURN: What is the proportion?

Witness: With the proportion of 3½ of atmospheric air, it will not burn. It requires about 4½ to make it burn. With 19 atmospheres to 1 of gas, it will not burn from excess of air.

By Mr. KARSLAKE: It is only when gas comes in contact with air that it becomes inflammable; so that, if you put a candle into a place full of gas where there is no air, it would be extinguished. Gas has a natural tendency to mix with air; but, in some scientific works, it is stated that every gas is a vacuum for every other gas—that is to say, that gas coming out of a burner would mix itself with atmospheric air: but, in reality, gas issuing in a jet from any pipe or opening where there is any pressure, is like a jet of water. It is not so strong as water, and will not continue so long; but it will mix with air, entirely dependent upon whether there is any obstacle to prevent it, or whether it lies in a pretty close place, where the air can mix with it freely.

Mr. KARSLAKE: Having mixed with air, what is the smallest proportion in which an explosive mixture is formed? How many parts of air, and how many parts of gas?

Witness: One to 10 is the worst; 1 to 17 will cause a very slight explosion. With 1 to 8, or 1 to 12, there is not much harm—that is, with this particular gas. I am speaking of common coal-gas; it makes a difference in it whether it is 12-candle or 13.

Mr. KARSLAKE: When you say the worst, I understand you to mean that it is the most violent explosion when mixed in that proportion?

Witness: Yes; 10 to 1.

Mr. KARSLAKE: Now, supposing gas to be escaping near a building which is warm—warmer than the external air—and there are apertures in that building, is the effect to draw in the gas and air very rapidly?

Witness: Yes; certainly. Any open door or window in the lower part of the house would almost inevitably cause the air and gas to be drawn into the house, because it is very seldom that the house is not warmer than the outside air. Sometimes in summer it may not be, but it is rarely the case. If there were an opening in the basement, such as a staircase, it would act as a chimney, and the gas and air would pass freely upward. I should explain that, though gas is lighter than air, when it becomes mixed with air so as to form an explosive mixture, its ascending power is very much reduced; its specific gravity is increased, and it is readily drawn in at any door or window. It then follows any current; there is very little difference between it and common air.

Cross-examined by Mr. BOVILL: Before this accident occurred, I do not know that I ever saw a 3-inch main bladdered when a 1½-inch service was to be inserted. A connector is very commonly used when laying on a service. [Witness described the mode of using the connector.] Whether the service-pipe is put into the main itself, or the connector is used, it is equally necessary to make the hole of the same size, and to make the same arrangement as to the screw. The difference which it makes as to the escape of gas is that the end of the connector is capped, while the service is being prepared. During the time of cutting or drilling the hole, there is no difference; but, if you have to measure your service, and bring it through the house, much time is lost. The use of the connector only affects the escape of gas from the hole after it is completed. I have heard it stated that, at the time of this explosion, the man was at work with his instrument at this hole. The use of the connector would have no bearing upon the question before the hole was finished. The use of an elbow is another contrivance; it is inserted in the pipe after the hole is finished; it has no effect until then.

Mr. BOVILL: Is it a common practice or not, where you desire to insert a service-pipe into a 3-inch main, to take the trouble to cut out the piece and then put in a T-piece?

Witness: It is only too common not to cut out the piece.

Mr. BOVILL: That is not a straightforward answer. I ask you distinctly whether you mean to say it is a common practice where a service-pipe is to be inserted in a 3-inch main to take out a piece and insert a T-piece?

Witness: I will not undertake to say it is a common practice; it may be done as many times one way as another, for anything I know. I believe it is not the common practice, in putting a service-pipe into a 3-inch main, to tap a hole and put the service into it, but to drill it. I have seen many hundred service-pipes laid, of all sizes. I have been consulting engineer to a gas-work, and am so now, at Weston-Super-Mare, and at Price's Works, at Bromley. I do not commonly attend to the laying down of services. I will not undertake to say that I have seen a T-piece inserted in a 3-inch main where the only object was to put on a service. The object of drilling is to get as nearly a round hole as you can; it is then made perfectly round with a chisel. If they do it properly, they have no necessity for a rymer—they use a tap and chisel. In drilling, they do not begin at the centre; the drill is of the entire width of the opening proposed to be made, and cuts a cylindrical hole through at once. There is a little escape of gas while the operation is going on, which increases to a certain extent until the hole is completed; but the men put a piece of hemp round the drill, so that, after all, very little escapes till the hole is made. In adopting the other mode, the man ought to mark on the main with chalk the position and the size of the hole he wants; but the common practice is to do it by guess. Having chalked round the hole, he takes a chisel and hammer, and chips a groove round the circle. During that process, there is no escape of gas whatever. Having got the groove what he considers the proper depth, he strikes the piece in with his hammer, and then, for the first time, the gas escapes. This system is more adopted in London than that of drilling—in practice, it is the commonest plan in London. When I say generally, it is not universal—it is very commonly adopted.

Mr. BOVILL: Do you know a single company in London which does not adopt the plan of bursting in the hole?

Witness: I do not know what the rules of the London companies are; I am not connected with a London company.

Mr. BOVILL: Do you mean to say that there is any ground of complaint against the Great Central Company for having burst through this hole, instead of drilling it?

Witness: So near the house. If it had been in a field, there would not.

Lord Chief Justice COCKBURN: It is in the next stage; it is not in cutting the hole. What he pointed out was that, when you drill a hole, you get a complete round; but, when you chisel away, there are some pieces left, and, though you get a hole, you do not get it in the same circular form as with a drill; and, during all that time, the gas is escaping. You are at cross purposes.

Witness: It takes, perhaps, three times as long; I am quite sure it will take double the time. I have seen the difference by experiment since this accident.

Mr. BOVILL: Now, I come to the experiments you have made. You

have told us that, when the gas escaped at a pressure of 10-10ths, you found that it passed out, gradually rising; and that, at 4 feet from the hole, it was 9 inches above.

Witness: Yes, thereabouts. We used a 3-inch pipe, and the gas issued at that pressure. I understood that in Wood Street, the man was at work with his chisel, and using both hands at the hole at the time of and before the accident. That would have the effect of breaking the flow of gas, to a certain extent, and causing some of it to disperse. I made an experiment with a trench and a hole in a wall. I found the gas lit 8 feet 6 inches from the hole in the pipe.

Mr. Bovill: You say that, at 4 feet from the main, the gas rose 9 inches, and you told me that you knew the man was stooping over this hole, and using both hands and a hammer and chisel—did you find out how far the gas had risen at 4 feet.

Witness: No, I did not measure it exactly; but I can tell you this, that the hole in the wall was 11 inches from the top of the pipe.

Mr. Bovill: In what case?

Witness: In the case of the man with the chisel. In that case, the gas rose 11 inches, because it went through the hole in the wall, which was above.

Mr. Bovill: You assume that it did go through the hole in the wall, and that is the reason for your opinion?

Witness: Yes. The wall was 3 feet 1 inch from the main, and the gas lit, after passing through the hole in the wall, at an elevation of 11 inches. The circumstances were made to resemble these as close as possible, and the light was held as might be here [pointing]—that is 8 feet from the pipe.

Lord Chief Justice Cockburn: The other side of the wall?

Witness: Yes.

Mr. Bovill: This is the experiment you are telling us of?

Witness: Yes.

Cross-examination continued: This experiment was performed very recently—last Monday week. There were a good many persons present. I can tell you the names of most of them. There were Mr. Siemans, Dr. Miller, Dr. Normandy, Dr. Price, Dr. Frankland, and one or two more. I did not give any notice to any one to attend on behalf of the company; in fact, I had nothing to do with it. I have not the least idea whether any one did attend, or had any notion that the experiment was to be performed. Mr. Carrington and Mr. Bramwell arranged the pressure for the experiment. It was kept up at 10-10ths during the whole time in the 10-inch main. There was a 3-inch main laid down at the same distance from the 10-inch as in Wood Street; in fact, it was Wood Street from Honey Lane, to Goldsmith Street, the proper distance as in Wood Street. The 10-inch main, and the 3-inch main were connected by two cross-riders. I saw that the 10-10ths pressure was continuous, and kept up, by the pressure-gauges.

Mr. Bovill: Are you aware, that here, the pressure was so far diminished, that the lights went out in the adjoining building?

Witness: That was on the 3-inch main, not on the 10-inch. I am speaking of the pressure of 10-10ths being kept up on the 10-inch main. I can easily imagine that the lights would go out in Messrs. Sturgeon's premises.

Mr. Bovill: Would that indicate to you, that the pressure was not kept up to 10-10ths?

Witness: I do not say it was in the 3-inch main in this experiment.

Lord Chief Justice Cockburn: The suggestion would be that the reason the lights went out at Sturgeon's, was that there was all this escape of gas from the 3-inch main.

Cross-examination continued: The length of the 10-inch main employed in the experiment was 100 yards. I believe, the total length of the Great Central 10-inch main is not several miles. I believe, in Cheapside, it is an 18-inch main. I know that the pressure at their works is more than 2½ times 10-10ths; it is 26¼-10ths. That was the pressure at the pressure-gauge of the company on the 27th of February, 1860, between ten and eleven o'clock in the morning. This [produced] is the pressure-paper. We had an order to inspect their pressure-paper, and this is a copy of it. The effect of the pressure at the works upon the pipes in Wood Street, would depend upon the length of main through which the gas had to pass previously, and the quantity of gas consumed from that main.

Mr. Bovill: But is it possible for you to form any opinion of the extent of the pressure in Wood Street without knowing the length of main through which the gas had to pass?

Witness: You cannot tell exactly, but the pressure on the Great Central Company's main, on the same day this year, was 11-10ths past the meter, and the meter will take 1-10th to drive it. This experiment was made with 10-10ths, which was the pressure at that time.

Mr. Bovill: But, keeping up 10-10ths at this experiment is very different to keeping it up in this length of main.

Witness: The pressure would be better kept up in Wood Street, because it is kept up through an 18-inch main.

Cross-examination continued: I will not say, of my own knowledge, that there is an 18-inch main. The pressure which I have given is that between ten and eleven o'clock in the morning, according to the pressure-paper. The lowest pressure I find here is 10-10ths, and the highest 26¼. I have pressure-papers for other days, in which I find similar differences.

Mr. Bovill: Just tell me whether it is not the pressure at night you have taken, and not in the morning?

Witness: It is printed here "morning." It may be a mistake, but I should think it is not. [The pressure-papers were handed to the learned judge for examination.]

Lord Chief Justice Cockburn: Are they uniform at the same hours?

Witness: Very nearly. On Monday, a little more; on Tuesday, less. On Sunday morning, they are very different.

By Mr. Bovill: The highest on Sunday is 24-10ths, and the lowest 10⅛. In general, the pressure is lowest in the daytime. It does so happen that here the highest pressure is in the daytime.

Mr. Bovill: Whatever is written there, must it not be manifest to any engineer that the highest pressure relates to the night?

Witness: Certainly not.

Mr. Bovill: Is it your opinion that the high pressure was during the day, and the low pressure during the night?

Witness: It began to fall very early, between nine and ten o'clock on Sunday night; it was very low between two and three on Monday morning; it began to creep up about four o'clock; it was higher at seven o'clock; and, at ten o'clock, it was within a fraction of 26½.

Lord Chief Justice Cockburn: Does that depend upon the consumption?

Witness: It depends upon the consumption, and the amount they turn on at the works.

Lord Chief Justice Cockburn: But, as the night advances?

Witness: Then, the pressure runs down as the draught comes upon it.

By Mr. Bovill: I do not know that there is a governor at Whitechapel, which reduces the highest pressure down to 14-10ths. I do not proceed upon the assumption that the pressure of 26-10ths at the works would be continued throughout. It would be reduced from the very time it left the works.

Mr. Bovill: But, independently of distance, supposing it is reduced intentionally, by a governor at Whitechapel, to 14-10ths—would not that materially alter your calculations?

Witness: I have not made my calculations upon this at all; I do not go by this paper the least in the world; it is no use to us.

Lord Chief Justice Cockburn: I suppose the only inference you can legitimately draw from it is that, from the amount of pressure at the works, there is no reason to suppose that, on Monday morning, at ten or eleven o'clock, there was less than the ordinary pressure.

Witness: There was no deficiency.

Lord Chief Justice Cockburn: That is the only inference that can be drawn from it; but that seems to be necessary

Witness: If they reduce the pressure at Whitechapel, they start afresh altogether. That would regulate the pressure of the gas in the mains for the supply of the city.

By Mr. Bovill: We tried the experiment with the man with the chisel and hammer again and again. We had two men—first one and then another. From the time the first man drove his chisel in, we were trying the experiment for 22 minutes, and the second, 16½ minutes. In the one case, 922 feet of gas escaped, and, in the other, 577 feet. The pressure in the 3-inch main, a few yards off, was 8½-10ths, and, in the middle of the 10-inch main, 10-10ths. The gas was going out at one end only, and the pressure within about a couple of yards was 8-10ths, which showed the friction in the main. The hole was closed, the light was put the other side of the wall, and then the hole was opened, and remained so, I should say, about 12 or 13 seconds; it might have been half a minute; I did not take the time exactly. A man with a light on a long stick lighted the gas the other side of the hole at 8 feet 6 inches distance. The distance from the pipe to the wall was 3 feet 1 inch, and the whole distance from the pipe to the place where the gas ignited was 8 feet 6 inches. It was done several times over in that way to see whether it would light at that distance, and it proved to my mind that the gas came through the wall. While the man was cutting the hole, the gas escaped, and a good deal. I do not say the whole of it, passed through the hole in the wall. It was in the open air—in a garden.

Lord Chief Justice Cockburn: It came through a hole in the wall. Was it perceptible?

Witness: Very strong; in fact, you could not stand it.

By Mr. Bovill: I do not know which way the wind was; it was very blustering; it blew in all directions. I think it sometimes blew towards the hole in the wall, as there was a difference between the times when the gas lighted. I will not undertake to say the wind was towards the wall. It was in a narrow lane, as near as possible like Wood Street. There were gusts and eddies of wind. I think that currents of wind did pass through the hole in the wall; and, if so, they would draw the gas in with them. The height of the wall was about 5 feet; it was at the Uxbridge Gas-Works. I do not know that the experiment had been tried before; a young man was sent down to lay the pipes, but I did not give him instructions to do so.

Re-examined by Mr. Karslake: As far as I could get information, I made myself acquainted with the nature of the trench and the position of the pipes in Wood Street. The object in the experiment was to make the place as near as we could like that. The trench we made was wide enough for a man to work in. In addition to the experiment referred to for the purpose of seeing the distance at which gas would light, we made experiments at the same time to ascertain the quantity of gas that would escape when a hole was drilled, as compared with the quantity which would escape when a hole was cut. There was less than half the quantity of gas escaped when the hole was drilled than when it was cut.

Mr. Karslake: For how many minutes was there an escape of gas where the process of drilling went on?

Lord Chief Justice Cockburn: Surely, this question does not turn upon whether the hole was cut or drilled? You seem to me, on both sides, to get as far as possible from the issues raised.

Mr. Karslake: You say that in a main larger than a 3-inch main, the insertion of a T-piece is common?

Lord Chief Justice Cockburn: No; the question was whether it was universally the custom to bladder?

Witness: It is the custom with large mains to use bladders, to prevent escape and danger—I mean 1, 5, and 6-inch mains; when you come to larger ones, you have indiarubber bags. The system of having mains so near the houses and under the footways is a new one, introduced of late years. I am not called upon to give an opinion, or I should say it was very dangerous. It stands to reason that they should take more care when this is the case.

Mr. Bovill wished to ask the witness a question as to the pressure-paper, upon which, he thought, he was under a mistake.

Lord Chief Justice Cockburn: No; all he says is they got an order to see the pressure-papers; and he gives you the result.

Mr. Bovill: If your lordship will look at the heading [paper handed up], you will see that "morning" is not written over the columns. It begins with Sunday night.

Lord Chief Justice Cockburn: I see it begins Sunday evening, the 26th of February, twelve o'clock, and goes up to twelve; and then starts from twelve on Monday morning to twelve again.

Mr. Bovill: It would start from twelve o'clock on Sunday night, and twelve o'clock in the day would be the lowest pressure.

Lord Chief Justice Cockburn: Surely, your witnesses will explain that. It may be so; but if so, I can only say it would have deceived me.

Mr. Bovill said the word "morning" was a general heading over that part of the paper. The witness had taken the pressure at eleven o'clock at night, and given it as the pressure of eleven in the day.

Lord Chief Justice Cockburn: I must say I should agree with the witness; but, as it is a matter peculiar to the gas company, we may be both very much in the wrong. When you start with the Sunday evening, and go over 24 hours, you come to the same point again.

Re-examination continued: I have taken the pressure several times at Wood Street. I took it as near as possible at the same time of day and the same day in the year as the fire occurred. One day, it was 11½-10ths past the meter, and the meter would certainly take 1-10th to work it, which makes the pressure 12½-10ths in the main. On another day, it was 10½-10ths, if I remember right; so that, whatever pressure there was at the works, it shows that it had been drawn upon very much. I went down to the works,

and asked for the pressure on the Monday morning, and I understood that it was what I have stated. I asked to see the instruments, but they would not let me see them. I asked whether "6-10ths" represented 10ths of an inch of water, and they would not give us the information.

Mr. *J. E. Clift*, examined by Mr. HAWKINS.

I am a gas engineer, and reside at Birmingham. I was engineer to the Birmingham and Staffordshire Gas Company. I have had experience as a gas engineer some 26 or 27 years. During that time, I have been much engaged in laying down mains and services.

Mr. HAWKINS: First of all, let me put to you the case of a main being laid under the foot pavement, within 3 feet 1 inch of the wall of the premises to be supplied—if a service-pipe, 1½ inch, is to be laid into it, tell me what modes you would suggest for the purpose of obviating danger?

Lord Chief Justice COCKBURN: Before this accident.

Witness: The ordinary mode, in my experience, whether before the accident or not, would be to insert a T-piece.

Lord Chief Justice COCKBURN: Do you say this in reference especially to the distance at which this pipe was from the house, or generally, without reference to it.

Witness: Generally, without reference. Before inserting the T-piece, I should bladder the main in the way described, in case of any particular risk about it, if it were close to a building, or close to an aperture where it was likely gas might be drawn into the building. That is the mode I should adopt in laying a 1½-inch service into a 3-inch main at all times. There are cases, I dare say, in my practice, in which 3-inch mains have been drilled, but I cannot call to mind any case where it has been done for a 1½-inch service. I have known service-layers cut the hole as described in the Wood Street case, but I invariably give instructions to my men not to cut a pipe for any sized service. I consider it most unmechanical, and the worst way of laying service-pipes. You get a ragged hole, and the chances are, you chip the main—perhaps make your hole larger on one side than is sufficient for the service—and, in the end, make a more inferior job of it than if you drilled the main. Sometimes, we tap the main on the side, and sometimes on the top; it depends upon its position. If the main is shallow, we tap it on the side; if it is a deep main, on the top. I cannot say that it would depend upon whether the main was near to the house to be supplied.

Mr. HAWKINS: Can you tell me, from your own knowledge, taking the pressure at 10-10ths, what would be the amount of gas that would escape per minute from a hole 1½ inch in diameter?

Witness: A 1½-inch hole drilled in a 3-inch pipe, with 10-10ths initial pressure at some distance from the hole, passes 50 cubic feet of gas per minute.

Mr. HAWKINS: And how far would the jet of gas be propelled?

Witness: I have made the experiment, and seen the gas lighted at 11 feet 6 inches from the main; that is, an explosion took place; we tried it. The gas was blowing very nearly two minutes, and at first we could not get the gas to light at that distance; but, after the wind subsided for a time, the gas blew in a straight line, was ignited by a lighted torch, and ran back to the main. The initial pressure was 10-10ths; it would not be that at the aperture. The gas was propelled through a trench. I made use, in my experiment, of the same apparatus that Mr. Cowper did, but mine was an independent experiment. The opening in the wall was 14 inches in depth, and 8 inches in width.

By the COURT: My experiment answered best when the wind was not blowing. When the wind was blowing, we could not get a light at all; the current of air set sideways, and blew the gas away from the wall; when there came a lull in the atmosphere, we succeeded.

By Mr. HAWKINS: When the gas ignited, there was an explosion, and the flame rushed back to the hole in the wall. The flame then passed from the main through the hole in the wall, which was 3 feet 1 inch from it.

Lord Chief Justice COCKBURN: As soon as you had ignited it, by the reflex action of the flame, the flame from the main passed through the hole in the wall?

Witness: Yes, passed through the hole in the wall, and then there was one continuous flame from the main through the hole.

Lord Chief Justice COCKBURN: In the first place, you lit the gas on the other side of the wall; if I understand you, that communicated with the current of gas at that time issuing from the main, so that you set up a current and ignited the gas coming out of the main. Did that gas, once set a light, extend itself back again through the hole in the wall?

Witness: It did; to the wall and through it.

By Mr. HAWKINS: In laying down a service from the main to the house, so near as the 3 feet 1 described, the hole in the wall should not have been made before the main was tapped and secured. I have heard the evidence of the witness who preceded me, as to the mode in which the main should have been tapped and capped to prevent the escape of gas, and I agree in the propriety of it. We do not use the short-piece generally in Birmingham; we do use what we call a short-piece, but it is longer than that, and we bring our connecting-socket over it. We get our pipe ready first, with some white lead round it; and, as soon as the main is tapped, we insert it, and screw it up. When we are near a building, we get our length of pipe, and put a cock on; we then get our running-socket, and bring the service-pipe up to it, and screw them together, so that there is scarcely any escape of gas.

By the COURT: We do not make a hole in the wall until we have made the hole in the main. There may be instances in which it has been done where there is no danger whatever; but not in the vicinity of buildings. We insert our service through the hole in the wall before we place it on the main, with a cock screwed on the end, in the cellar where the meter is to be placed, and, having got the right length of pipe, we take the cap off the piece first inserted in the main, and screw it on with a socket.

By Mr. HAWKINS: Gas issuing from a main at 10-10ths pressure, would go with considerable force in the direction of the wall. I have made some experiments on the subject. I took a bundle of tow—such as main-layers use, and such as service-pipe-layers always carry with them in their carts—and had it made into a ball, to bar the hole in the wall, and it was forced into the hole described, in the garden-wall at Uxbridge. The workman at the gas-work took it in his hands, and pushed it into the hole, as a service-pipe-layer would do it if he were going to stop it. We then turned on the gas with 10-10ths pressure, and allowed it to blow against the hole. A light was held on the opposite side of the wall, and the gas was ignited at a distance of 3 feet from the hole, or about 6 feet 9 inches from the main—the thickness of the wall being about 9 inches. In this case, the flame did not rush back to the hole. We did not try that experiment more than once.

By the COURT: It was nearly two minutes before it exploded.

Cross-examined by Mr. BOVILL: I did not take the tow that was put into the hole; it was at the gas-works. I did not ram it in. I saw it done; the workman at the gas-works did it. It filled up the hole; you could not see through it. It was plain, not tarred, tow. I never heard that it was tarred tow which was used in Wood Street. I do not think that would make much difference; the spaces through it would be quite as large.

Lord Chief Justice COCKBURN: Would they not be larger? It would prevent its compacting together.

Mr. BOVILL: Would it not stick together?

Witness: If rammed in tightly, it would; but the mere force of putting it in the hole would not do it. You might, possibly, ram it in so tight that you would not get it out again.

Mr. BOVILL: You could ram it in so tightly that no air could get through it?

Witness: Certainly; but service-layers do not usually do that.

Cross-examination continued: They sometimes stop the end of the pipe with tow, to prevent the escape of gas from it. I should say it does not effectually do it; there must be a considerable escape through yarn forced lightly into a pipe. You cannot ram it sufficiently tight; there is nothing to ram it against. The height of the wall here was about 6 feet; it was higher than my head, and I am about 5 feet 8 inches. We used a torch made of yarn held on the end of a long stick, about 3 feet 6 inches from the ground. The gas had been escaping from one to two minutes at the inch-pressure—perhaps not more than one minute.

Mr. BOVILL: As the flame did not go down to the hole, are you quite certain that the gas which exploded did not come over the wall?

Witness: If it had done so, the flame would have passed over the wall to the hole.

Mr. BOVILL: I thought you said the gas did not run back to the hole.

Witness: It did to the hole in the wall, but not to the pipe. We shut off the gas instantly in the experiment with the tow, because it became ignited. If we had not called to the man who had charge of the valve to shut off the gas, it would have gone to the main, there is not the least doubt. The service-layers do not generally use tarred yarn for that purpose. I do not know the practice in London. It was in the JOURNAL OF GAS LIGHTING, that I saw it stated the hole in the wall in Wood Street was 14 inches by 8. At that time, I had no intention of being a witness. I read the whole of the evidence at the last trial. I saw that the man stated at first the hole was only large enough to put his arm through, and I saw it was afterwards stated that it was 14 by 8. I did not see that it was made larger after the fire, to let the water out of the trench. I did not try an experiment with a smaller hole.

Mr. BOVILL: The experiment would be materially affected by its being a smaller hole?

Witness: Almost every circumstance you can name would affect the experiment. If for instance, instead of a road on one side, and a garden on the other, you had a road on one side, and a house on the other. The effect would be much greater by the gas rushing into a house where gas-lights were burning, and the air was warmer, than if it were rushing into a garden. I did not read in the evidence that the morning of the fire was gusty and windy. The hole which I experimented upon was 14 inches vertically. It would make some difference whether gas was passing hrough a vertical, or horizontal hole of that size, because gas has a tendency to rise as it leaves the main; and, if the hole were deeper, more gas would pass through it. If the hole in the wall were secured, there would be no difficulty about the hole in the main; there would be only the waste of gas. I had the superintendence of laying on services for some years in Birmingham. It is not the practice there to insert service-pipes in 3-inch mains without using a T-piece; there might have been exceptions; I cannot give you every instance. There were cases when there was strong competition, in which the holes were cut, instead of being drilled, as it was necessary to lay the services quickly, for the purpose of securing customers. In making my experiments, it was assumed that the pressure in the Great Central main, when all the customers were burning, was 10-10ths. I believe it is never less than that.

Lord Chief Justice COCKBURN: Do I understand you to say that the ordinary normal pressure is 10-10ths?

Witness: I believe in London it is never less than 10-10ths. The initial pressure at the works is much larger, so as to allow 10-10ths at the extreme points of all the mains.

By Mr. BOVILL: I should say that is the pressure night and day. There is no reason why the pressure should be greater at night at the burner than in the day. If it is so, it is not, in my opinion, good working. [Pressure-paper handed to witness.] I should take this paper to be from twelve o'clock at noon to twelve o'clock at night. I find the lowest pressure here is 9-10ths. This paper is perfectly consistent with what I should understand to be the practice. I should not understand from it that the highest pressure was at night, and the lowest in the day, for this reason—that I see the pressure rises at about twenty minutes past four, and it would be perfectly inconsistent that a larger amount of pressure should be put on at that hour in the morning.

Lord Chief Justice COCKBURN: This is a terrible waste of time. As I said before, it may be a mistake; but those who made the mistake can correct it. [Papers handed up.] According to this, on Saturday, the highest pressure is at four o'clock in the morning.

Mr. BOVILL: That would be for the supply to Billingsgate.

Witness: At the time the pressure is put on there, there is a very large consumption, which draws down the pressure.

Lord Chief Justice COCKBURN: According to this paper, it rises at four o'clock in the morning; then it goes down to the lowest at twelve o'clock in the day (which would seem rather inconsistent), and goes up to the highest at nine o'clock. Is that so? You see that being Sunday, it may make some difference.

Witness: Yes, it makes a great difference. At twelve o'clock at night, there is 11½-10ths up to three o'clock in the morning; it rises then to 24-10ths; and at four o'clock it goes down to 14-10ths, and gradually decreases down to 8½-10ths at ten o'clock in the day. Then, it begins to rise at half-past two, and gradually gets up to the maximum again, at 13-10ths, at nine o'clock at night.

Lord Chief Justice COCKBURN: That would seem to be inconsistent.

Witness: It may be quite consistent, because the consumption decreases from the time it is put on.

Lord Chief Justice COCKBURN: Not at nine o'clock at night.

Witness: The manufactories and warehouses are then closed.

Cross-examination continued: In the actual supply of gas, there would be the draught of all the consumers; but that would not affect the experiments we made, because we allowed for the draught, reducing the pressure to 10-10ths. Cutting so large a hole as a 1½-inch in a 3-inch main at the same time the customers were being supplied would, of course, draw away the gas very rapidly within a few feet of the hole, and cause the lights in the adjoining houses to go out. There is this material fact that, when that hole is open, you are discharging 50 cubic feet per minute from it; and

of course it is that which reduces the pressure, and is the thing complained of. That discharge would be materially affected by the man with his hand and chisel before the hole. I have not tried to what extent.

Re-examined by Mr. HAWKINS: That 50 feet per minute would be issuing at 10-10ths pressure. The yarn with which the hole was stopped in my experiment was rolled up as close as possible, and forced in with as much force as a man could put into it.

Mr. BOVILL: A round ball in a square hole?

Witness: It filled up the hole; the experiment was as fair as I could make it.

Mr. *Thomas Dand*, examined by Mr. HOLLAND.

I am an engineer, and manager of the Buxton Gas-Works. They are not very extensive. I have also been engaged at the St. Helen's and Droylesden works; and, during that time, I superintended the laying down of service-pipes. I have laid services on 3-inch mains. The course I should adopt in laying a 1½-inch service on a 3-inch main would be to connect them by means of a T-piece, 3 by 1½. I never had but one case of that sort, and then there had been a T-piece left in at the time the main was put down, expressly for the 1½-inch service. In other cases, I have bladdered off. I have drilled a hole in the main on each side of the place where the T-piece was to be inserted, and put in bladders. Afterwards, I made the hole in the wall of the house. I have never made the hole in the wall until the main was secured, when the service was beyond the size of an inch. I should prepare the main first, and make the connexion all ready for going forward with, and then I should commence to have the hole prepared. I have not adopted the course of bladdering without using a T-piece. I know the methods of drilling and cutting. If there were lights burning in the house to which the service was to be laid, I should take the precaution to have those lights put out before I proceeded to lay on the service, more especially if there were apertures through which the gas could enter. I agree with the other witnesses, that gas diffuses itself very rapidly with the air, and that, if the air in the house were warmer than that in the street, there would be a considerable indraught. I have not gone into a calculation of the quantity of gas that would escape per minute from a 1½-inch hole.

Lord Chief Justice COCKBURN: There was no cross-examination upon that.

Cross-examined by Mr. LUSH: I can form no idea of the number of 1½-inch services I have laid. I have laid more than one. In never but one had there been a T-piece left in the main. I do not remember putting a 1½-inch service on before. I am engaged now at Buxton. I have never been actually at work in London.

Re-examined by Mr. HOLLAND: It depends upon the position of the main, whether near to a house or not, as to the amount of precaution necessary to prevent an escape of gas.

A JURYMAN: It appears to me, my lord, that, this accident having taken place in London, and many of the jury having heard the evidence on the last occasion, we ought to be guided by the London practice, and not that of the country. We wish to ask your lordship whether all this evidence is really relevant to the point?

Lord Chief Justice COCKBURN: It is only so far relevant, that you get the experience of persons who are experienced in laying on gas, and are not interested as being connected with the London gas companies, and who tell you what they think, as to whether what was done was prudent or not prudent. Of course, it would be much stronger if it were the evidence of persons who had had experience of gas affairs in London; still, we cannot shut it out—it is perfectly in order. At the same time, you (Mr. Karslake) have heard the observations of the jury, and will guide yourself by them.

C. E. Cawley, Esq., examined by Mr. KARSLAKE.

I am a civil engineer, and a member of the Institute of Civil Engineers. I practise in Manchester and London. I am well acquainted with gas-works. I am a member of the corporation of Salford, and deputy-chairman of the gas committee of that borough, and have been so for the last seven or eight years. I have attended to all matters connected with gas. The practice in laying down services from mains into houses is various, depending upon the position of the main. The universal practice, where a large service like this has to be laid, which is out of proportion to the size of the main, is to cut out the piece, and insert a T-piece. The necessary effect of laying so large a service on a 3-inch main is to weaken that main, but that is not the principal thing.

Lord Chief Justice COCKBURN: Do you say that with reference to any service-pipe, or to a 1½-inch on a 3-inch main?

Witness: To a 3-inch main which has a service-pipe one-half the diameter of the main itself.

By Mr. KARSLAKE: It sometimes happens in a back street, where a 3-inch main has been laid down, that it is necessary to put in a service of that size, and in that case the main would be bladdered, and a T-piece used. In such a case as this, it would certainly not be right to do it without a T-piece. It is the more necessary where the main is near to the house. That which might be admissible in one case is totally inadmissible in another. A great number of our mains in the outskirts are laid along road with gardens between them and the houses; in that case, if the T-piece were not used, there would be no further mischief than the stink of gas. If the main is near to the house, there must necessarily be greater danger. If the hole were made on the top of the main, the danger would be diminished, because the gas would pass off. To cut a hole like this in the side of a main, without bladdering, is a very improper mode. I am not in the habit of standing by our men to see the operation of service-laying performed; but, if a man were known to open a hole in the wall of a house without having properly secured the hole in the main, he would incur the great displeasure of the committee. The bladders are commonly carried by the service-layers in Salford, and used by them. Drilling is the mechanical mode of making the hole in the main, and the other mode, that of cutting, is not what any mechanic would adopt. I am aware that it is done by gas-men who are not mechanics; but, it is a very inferior and clumsy mode. There is a difference in the amount of the escape of gas, whether properly or improperly done, so that if you do not bladder it is better to drill than to cut a hole. I witnessed the experiments made at Uxbridge, alluded to by Mr. Clift and Mr. Cowper. We made two experiments with the gas propelled from the main to the wall. The gas ignited, when the hole was 14 by 8 at 5 feet 6 inches from the wall, within a few seconds. A man held a taper at the end of a stick at that point, and the gas exploded when it reached it. In the second experiment, we diminished the hole to 5½ inches square, and the gas ignited at perhaps a foot nearer the wall in about the same time. These experiments confirmed the impression I had, that with a less pressure the gas would be impelled towards the wall. The experiments show that gas issued from the orifice of the pipe with a velocity of 3600 feet per minute, and the projectile force so much as to carry it through the wall.

Cross-examined by Mr. LUSH: I am a civil engineer; I do not practise as a gas-engineer. At Salford, I have the honour or the misfortune to be one of the aldermen of the borough, and am deputy-chairman of the committee of the gas-works which belong to the corporation. Being a civil engineer, I am, as a necessary consequence, consulted by the committee. We have a gas manager, and an inspector, with persons under him; and it is his duty to superintend the laying down of services. I know a person of the name of Brothers; he was our manager. He would very rarely see service-pipes laid down. I have seen it done, but I have not superintended the operation; it is not the duty of the manager, but of the inspector. I am quite sure Mr. Brothers, if he is here, will not say that he would lay a 1½-inch service in a 3-inch main in this way. I have never had anything to do with laying down gas-pipes in London. I believe in every case in which, at Salford, we have had to lay a 1½-inch service in a 3-inch main, the T-piece has been used. I believe I have seen it done; I will not swear that I have actually seen it; I will not say more than one. Whenever a T-piece is employed, our inspectors would use bladders. It is not often that a 1½-inch service is required on a 3-inch main. We do not put in a T-piece in the larger mains.

Re examined by Mr. KARSLAKE: A civil engineer is consulted on almost every subject. I have had very much to do with railways and water-works; but, within the last few years, I have been consulted and given evidence before several committees of the House of Commons, on gas matters.

Charles William Siemens, Esq., examined by Mr. HAWKINS.

I am an engineer in Great George Street, Westminster. I have turned my attention to the subject of gas. I have not, as a special study, applied myself to gas engineering; but I have been consulted as to the cause of gas explosions; and I have turned my attention to every application of gas. I have never superintended the laying down of service-pipes. I have heard the evidence given as to the state of the premises in Wood Street, as to the number of burners there were, and as to the position of the burner at the top of the stairs. I have carefully considered the question as to whether, supposing that that burner was not turned off, and the gas escaped from it, it would be possible that that was the cause of the explosion; and, I say, certainly not. The burner on the top of the stairs could have no possible relation to the explosion, because the seat of the explosion, as appears by the evidence, was the basement; and gas issuing from a burner could never disperse itself downwards against the ascending current of air. Looking at the construction of Mr. Morley's premises, there would be naturally a very strong current take place in a building like that. The quantity of gas that would be emitted from an ordinary burner would be about 5 feet an hour. I think it would be impossible—having regard to the construction of that building, and to the upward draught which of necessity there was—that, even supposing the burner was left turned on, so that the gas could escape at the rate of 5 cubic feet per hour, there would be a sufficient quantity escape to cause the explosion. Explosive mixtures only take place where certain quantities of gas are mixed with certain quantities of air. Now, the smallest quantity of gas necessary to make an explosive compound is about 1 in 14—*i.e.*, fourteen volumes of air to one volume of gas.

Lord Chief Justice COCKBURN: Is that an ascertained fact—because one gentleman tells us 1 in 10?

Witness: One in 10 is most violent.

Lord Chief Justice COCKBURN: Less than 1 in 14 will not explode?

Witness: It will not produce an explosion; it will, up to 1 in 16, produce ignition. One of gas to 13 of atmosphere will produce the first symptoms of explosion, and 1 in 17 ignition. The quantity of gas issuing from a bat's-wing burner is 5 feet per hour; and the quantity of air which could be converted by this quantity of gas into an explosive compound, would be 14 times 5, or 70; therefore, the gas issuing out in one hour, supposing it could be confined to the small space of 70 cubic feet, would cause a local explosion. But, if we consider that the volume of air enclosed in that basement was about 4000 cubic feet, the whole volume of air it contained could not be converted into an explosive compound, except during a very considerable portion of time—during sixty hours; but, long before such a result could occur, the draught naturally passing into the house at the basement, and out at the roof, would render such an accumulation quite impossible. In witnessing some experiments at the present premises of Messrs. Morley, which, in viewing this model, appear not to differ very materially from the former structure, I found that a very powerful current existed, passing into the basement through the French windows below the grating, and up the staircase into the house.

Lord Chief Justice COCKBURN: It would be a draughty place, this staircase?

Witness: A large volume of air would pass up, owing to the large sectional area of these openings.

By Mr. HAWKINS: The experiments I witnessed were arranged to show whether an indraught existed; and, in the next place, to show whether this indraught would carry with it a sufficient quantity of gas to account for the explosion.

Lord Chief Justice COCKBURN: There is another question I want to ask before you part from this subject. In order to get that necessary quantity of gas in its combination with 4000 cubic feet of atmospheric air to cause the explosion, would the smell be very strong?

Witness: The smell would become very strong, if only ½ per cent. of gas were mixed with air.

Lord Chief Justice COCKBURN: Then, before you could get the quantity necessary to cause an explosion in the mixture with 4000 feet of air, supposing it were the result of gradual accumulation going on at the rate of 5 cubic feet per hour, would it be possible for anybody to go into the place, and not experience the smell?

Witness: I think, before the explosive mixture was created, it would be impossible.

Lord Chief Justice COCKBURN: It could not be done in the basement by the accumulation of gas without being perceived?

Witness: I think it quite impossible.

Lord Chief Justice COCKBURN: It seems to me you do not want any science to tell you that, when you have got the datum that you require, 1 measure of gas to 14 of air to cause any explosion, and 1 in 10 to cause such an explosion as would shatter a house down. It shows this, that if one burner had been left open for several hours, before it reached the point of explosiveness, you must have had such a smell of gas as would have suffocated anybody.

Mr. HAWKINS (to witness): You said that your experiments were directed to two objects—first of all, to ascertain whether there was an indraught. For that purpose, did you close the upper French windows, and leave those below the pavement open?

Witness: As far as I recollect, there was one of the two French windows below the grating open; that is, below the level of the pavement. A trench,

where the gas-pipe was introduced with the opening, was made, in the exact position that I understood the hole had been made by the Great Central Gas Company's men; and it was a similar pipe to supply the gas from the meter inside the premises. I may, perhaps, describe how this was arranged. The meter in the basement had a flexible tube connected to it, of an inch-and-a-half diameter; this tube was brought through the French window, and, through the grating, into the trench, and there it was connected to a T-piece of wrought iron, with a hole of 1·20 inch. This aperture was placed at the distance of 3 feet from the side of the house, in the trench, and facing the house. On turning the gas on, the first experiment was to ascertain that there was an indraught, and that gas came from the trench over the bridge of pavement, and passed, through the French window, into the basement. Several chemists who were present took samples of the mixtures of the gas contained in the basement of the premises between the French window and the staircase, and the result, as I understood, was, that nearly 2 per cent. of gas was found in the air passing through the basement.

Mr. HAWKINS: Do you know that of your own knowledge, or is it from what has been told you by the gentlemen who made the experiment?

Witness: I watched the gentlemen taking the gas, and asked them afterwards what was the result of their observations. Mr. Dugald Campbell told me that one of the samples contained 1·96 of gas. The quantity of gas issuing from this aperture I also ascertained to be equal to 10 cubic feet per minute, and it stands to reason that the proportion, or per centage, of gas that would have been found in the basement, would increase, according to the quantity of gas issuing—that is, if 20 cubic feet of gas were issuing in one minute, it is natural to suppose that the per centage of gas in the air would have been nearly 4, &c. Therefore, in order to determine whether an explosive mixture could be formed in the basement from the issuing of the gas in the trench—there being no other aperture in the building but the grating in the French window—it was necessary to ascertain what quantity of gas could have issued at the time the explosion took place. I witnessed experiments showing that result, subsequently.

Mr. HAWKINS: Within what period of time would an explosive mixture have been created by the escape from the main, taking it at 50 cubic feet per minute?

Witness: It would be formed in a very few seconds. It is not necessary to assume that the whole 50 feet would find its way into the apartment. I have allowed for any gas which would have diffused itself outside. I could not tell what per centage of the whole of the gas issuing from the main would find its way into the basement—nor is it a matter of very great consequence.

Mr. HAWKINS: You say the explosive mixture would have formed in the course of a few seconds?

Witness: Not throughout the basement, but in a particular part of it.

Lord Chief Justice COCKBURN: But would not the gas have a tendency to diffuse itself over the whole?

Witness: The diffusion of gas goes on very gradually; it is a question of time, and of quantities. But, in this case, the current of air and gas mixed, which would be of nearly the same specific gravity as the air within, would be drawn in bodily, and pass like a great stream from the window to the staircase.

Lord Chief Justice COCKBURN: You mean it would be mixed with the air before it got in, and be drawn in by the current and go in bodily in a mass?

Witness: Certainly; like a great stream already prepared, before it got in. The fact of its striking first against the wall and dispersing to a certain extent would, in my opinion, further increase the liability to ignition of that stream.

Lord Chief Justice COCKBURN: Why?

Witness: Because, if the stream was formed of a body of air with a current of gas through, it might be that the current of gas would keep a sufficient length of time distinct and separate; like two rivers, the water of one of which would not mix immediately with the water of the adjoining river, but only gradually intermingle. With gas, this process of intermingling would be much more rapid than in the case of water; still, a certain time would elapse before an intimate mixture was formed, and thus the time before any particle of air could go from the trench outside the house to the staircase would naturally be less than a second, which is very little time for effecting such a mixture, and for that reason a partial break of the current in artificially mixing would facilitate rather than decrease the danger. When the layer of explosive mixture got sufficiently thick to reach the burner, the consequence would be, that the whole mass of explosive compound would instantly explode; and the next consequence would be, that the flame would proceed to the issue of the gas. I took observations of the pressure in the Central Company's main in Wood Street in February last. Between ten and eleven o'clock in the morning, I found that the pressure, when no gas-burners were lighted, was 11½-10ths, but it varied down to 10-10ths.

By the COURT: I took the pressure on one occasion only.

Cross-examined by Mr. BOVILL: This is not the first time my attention has been directed to gas. I have no practical experience in laying down pipes. I have endeavoured to investigate the causes of explosions. I have sometimes found it very difficult to account for fires and explosions. I believe it was on the 6th of February last that I made experiments at Wood Street, in Messrs Morley's present premises. It was since the last trial. I was not engaged at the last trial. I read the evidence subsequently. I believe I read it after the 6th of February, but I am not sure. I think Mr. Bramwell and the engineer arranged that I should go and make the experiments on the premises. He asked me to witness some experiments there, in order to ascertain what my opinion was about it. I do not know what the arrangement between Mr. Dawes and Mr. Bramwell was. I was asked to go on a certain day and witness some experiments. I believe Mr. Morley was there when I went. I do not know that Mr. Sturgeon, or any one on his behalf, was present, except Mr. Bramwell, who, I suppose was acting for the plaintiffs. There were a number of other gentlemen present there. I think there were two engineers, Mr. Cowper and Mr. Reynolds. Mr. Upward was not there, and I believe there was no one present to represent the Chartered Gas Company. I found one window open under the grating when I went, and the other shut. I believe the windows above the gratings behind the bars were closed. I have no very distinct recollection whether the bars themselves were closed. The object and intention were to represent the state of the premises at the time of the explosion. There was a trench opened, so as to make it correspond as nearly as possible.

Lord Chief Justice COCKBURN: I do not quite see the purport of the trench.

Witness: It was in order to have the issue of the gas in the same position. A smaller relative quantity of gas was made to issue.

Mr. BOVILL: They did not tap the main, but brought a flexible pipe from their own meter.

Lord Chief Justice COCKBURN: To see whether the gas would find its way in?

Witness: That was it.

Mr. BOVILL: Then you did everything to place the premises in the position they were in at the time of the explosion?

Witness: With this exception, that the quantity of gas that issued was much smaller; and, in the next place, we took care not to have any lights.

Cross-examination continued: The earth out of the trench was thrown about. In the case of a chimney, we do not sometimes find the current going down instead of up, except there be a special cause. A chimney will smoke the wrong way when it gets very warm in spring; but, in a house which is heated in consequence of gaslights burning, and a number of persons being there, the current would always be induced upwards—that is the universal law.

Mr. BOVILL: But it sometimes does happen that the universal law of nature is interfered with by winds in contrary directions?

Witness: Not in an open chimney. It may, if a chimney finishes under a wall which is higher than the chimney, and the wind passes over the end of the wall.

Mr. BOVILL: But I am speaking of an ordinary kitchen or dining-room chimney which burns very well for two or three days, then the wind changes, and the smoke comes down.

Witness: I have seen it, but this case is very different. In a house, there are several chimneys and fires, and sometimes one is more powerful than another; but, when you deal with a large area like these premises, and with volumes of air of such magnitude, these small disturbing causes would not operate. The currents of air in a large building, such as this, heated inside and lighted by several apertures, would always be upwards. [Witness explained, by reference to the model, the direction of the currents of air through the building.] A chimney differs very essentially from the condition of a house, inasmuch as the chimney has only one outlet; and, if local causes act upon that outlet, it might stop the natural current, and cause the smoke to go down. If a chimney has more than one outlet, there is not a probability that the smoke will descend. The general cure applied to a smoky chimney is to increase the height, and cover the outlet. I do not think the contracting of the opening would have that effect, nor do I think if, instead of reducing the opening, it were increased to twice the extent, it would increase the tendency to smoke. If a single gas-burner were left open for hours, you would have a microscopic explosion a few feet above it on applying a light, just as we see in lighting chandeliers.

Mr. BOVILL: If a burner were left open, there might be, from a peculiar state of the atmosphere, an accumulation of gas to the extent of 1 in 14 of atmospheric air in one corner of the building, which would cause an explosion.

Witness: It would not. Two causes operate upon the issue of gas—in the first place, the current of the gas, and in the second, its diffusion. If a quantity of gas so small as one burner would give, were allowed to escape into a room which is perfectly closed, the time would be very great before an explosive mixture were formed. In a room like this, it would be about eight hours. The case is very different when a large quantity of gas issues from one aperture.

By the COURT: If the cock were left open from Saturday night to Monday morning, the gas would have diffused itself over the entire room.

Mr. KARSLAKE: And over the whole house?

Mr. BOVILL: I need not trouble your lordship upon that point; it is not suggested that it was escaping from Saturday night to Monday morning, because the gas was turned off at the meter.

Lord Chief Justice COCKBURN: As I understood at the last trial, it was suggested that, when the man turned off the gas on the Saturday night, he omitted to turn off effectually one of the burners.

Mr. BOVILL: No, my lord; that he turned it off at the meter, but not at the burner, and, that when the gas was turned on on the Monday morning, it began to escape from that burner.

Lord Chief Justice COCKBURN: But then you see it becomes a matter of physical impossibility, that between the hour of 8 in the morning and the time of the explosion, a sufficient quantity of gas could have accumulated to account for it.

Mr. BOVILL: It is not for me to say how it occurred.

THURSDAY JULY 4.

Dugald Campbell, Esq., F.C.S., examined by Mr. POLLOCK.

I am an analytical chemist, and have had great experience, both practical and theoretical. I am well acquainted with the properties of coal-gas, and of its diffusion and mixture with other gases. Coal-gas very readily mixes with atmospheric air or any other gas. If coal-gas is admitted from a jet into the atmosphere, there is a diffusion through it, and it becomes an explosive compound, when the air predominates over the gas to a certain extent. When the gas reaches to about 7 per cent. of the air—that is to say, when air contains about 7 per cent. of gas, it will then become explosive. That would not be the most explosive compound. From 10 to 12 per cent. is highly explosive. When there is about 20 per cent. of gas, the mixture is more combustible than explosive. I have seen the premises in Wood Street since they were rebuilt. I have also seen the model which represents them as they were. I have measured the quantity of gas that would escape from a batswing burner at a pressure of 10-10ths at the meter; it would be about 5 cubic feet per hour. If a single burner had been left unturned in the basement of these premises, there would not be sufficient escape to form an explosive compound for some hours, even supposing the basement to be hermetically sealed. Suppose the basement, instead of being hermetically sealed, to have been open as shown in the model, I do not think that in any given amount of time during which the gas might be allowed to escape, there would be found an explosive compound, the diffusion would be so great, and the draught also. It would take about 4000 cubic feet of air to fill that place. Before any explosive compound was formed, the smell of gas would be very perceptible. A half per cent of coal-gas in air is distinctly perceptible, and is obnoxious.

Lord Chief Justice COCKBURN: Making allowance for the draught of air in such a place, you do not think it would ever explode?

Witness: I am sure it would not.

By Mr. POLLOCK: Supposing, instead of one, there were two or three burners left open in this basement, it would take a very long time—some hours—before an explosive compound was formed; and the same observation which I made with reference to the smell, would apply with increased force. I have proved by experiment what would be the current of air in such a building as that. I was with the last witness on the 6th of February, at Wood Street, and witnessed the experiments which he detailed; I also took samples of the atmosphere after the gas had been allowed to

flow in the way described by him. We first tried, by means of lighted papers held up towards the window, whether there was an indraught. The first experiment was made with all the windows open; the second with only the lower half of the French window open. In the latter case, we found, by the lighted paper, that there was a very noticeable indraught. We then made an experiment by putting out all the lights, and allowing the gas to flow in, taking the time when it began to flow, and the time when I took my specimens. The flow of gas from the orifice, which we made in the experimental pipe in the trough, was at the rate of 10 feet per minute, as measured at the meter. The size of the orifice was 1¼ inch, or thereabouts, and the distance of it from the wall was 3 feet 1 inch. I took the atmosphere from midway between the window and the staircase in the basement, after the gas had been allowed to flow 3 minutes, 4 minutes, and 6 minutes. At 3 minutes, the proportion of gas to air was, as near as possible, 1 per cent.—rather under 1; at 6 minutes, it was 1·94—in fact, 2 per cent. No. 4 was not examined, as our apparatus broke. We did not repeat that experiment under a different pressure that morning. I was at Mr. Sturgeon's, taking the pressure upon several occasions, and I have also been there lately, taking the specific gravity of the Great Central gas. The pressure of the gas has varied from 11½-10ths to 10-10ths, at the same hour as nearly as possible. It had then passed through the meter. It was tested in the usual way with the pressure-gauge. I did not notice, on those occasions, the extent of the escape. I made the experiments, referred to, at Uxbridge. The pressure used there was 10-10ths—where the gas flowed, to within a few yards of where the hole was made, the hole being the exact size, as I was told, of the hole that was in the pipe at the fire. The pressure which was 10-10ths at the meter, a few yards off was 8-10ths at the orifice. It was found that 55 cubic feet of gas flowed per minute, allowing for leakage and for burners, presuming that there were a number of burners being supplied with gas that morning. The escape was nearly 60 feet per minute, and we allowed 5 feet for leakage and burners, which I consider a large allowance. As the result of my experiments, I should have expected to find as near as may be 12 per cent. of gas in the air of the basement of the premises in Wood Street, through the escape from the hole in the main on the morning of the fire, in the space of 6 minutes, instead of 1·94.

By the Court: In the one case, the meter was only delivering gas at the rate of 10 feet per minute; whereas, in the other, it was delivered at the rate of from 55 to 60 feet. That difference would be caused by the size of the hole. We were afraid to make the hole so large as the original, for fear we should set fire to the neighbours. We wished to repeat the experiment on the same premises, but they said they had had enough of it.

By Mr. Pollock: Supposing the gas had been escaping at that rate for six minutes, with lights burning in the basement, there was quite sufficient to account for any explosion. Gas is a fluid which diffuses itself very readily. I have made experiments to try its power of diffusion through other substances. I made the experiments detailed by Mr. Siemans, at Uxbridge, and, besides those, we tried it by putting tow in the hole in the wall. We made two experiments—one with a large hole, and one with a lesser one. With the lesser hole—which was not more than 7 inches square, the wall being 3 feet 1 inch from the hole in the pipe—we found the gas exploded at 4½ feet beyond the wall. That was without the yarn. When the yarn was there, we found it explode within a foot beyond the wall, and within two minutes after the gas was turned on. The yarn was rammed tightly in the hole, and a small piece of spun yarn was tied on a stick, and lighted, and held within a foot of the back of the wall, when the gas ignited, showing that a sufficient quantity passed through to make an explosive mixture. That experiment was repeated twice, with the same result. The effect of the explosion was, that the fire rushed back to the orifice in the pipe. The gas exploded at about 8½ feet beyond the wall, when there was no tow in the hole—the circumstances being all precisely the same as to time, &c.

Cross-examined by Mr. Bovill: The size of the hole in which the tow was put was, in one instance, 14 inches by 9, and, in the other, 7 inches square. In each instance, the hole was angular. The tow was in a round ball, and the man knelt down in the trench, and pushed it in with his hands. I did not see him use any other instrument. After it was put in, I looked to see if there was any daylight through it, but could not see any. The experiment was made in the way I have detailed, and the gas went through it, to my surprise, in a very short space of time.

Mr. Bovill: Was it your opinion, before the experiment, that the gas would have passed through the tow that way?

Witness: I should have expected, in the course of time, that some would have passed through, even if it were in the open air; because, if you have a hole this distance, it will impinge upon the ends strongly, like a jet of water almost. The flow of gas is very strong.

Mr. Bovill: Did you try whether there was any current of air through the hole?

Witness: We observed that there was no current of air through the hole. I tried it, in the first place, with a handkerchief, and, not being satisfied with that, I tried it with tissue-paper. That was just before the tow was put in.

Cross-examination continued: I was much surprised at the rapid manner in which the gas went through. I have not been called in at any gas explosions, but I have made many experiments on the subject. I had no difficulty, when the details of this fire were given me, to account for the explosion. I knew I was called in by the insurance office. I had no doubt the gas went down the area into the lower part of the premises; and, having made the experiment, I find that it would do so. There was no tar in the yarn we used; it was a perfectly clean piece of spun yarn. I am not acquainted with the mode of laying services.

Re-examined by Mr. Karslake: As far as I could ascertain, the hole was fully stopped before the experiment.

Dr. *Alphonse Normandy*, examined by Mr. Karslake.

I have practised for many years as an analytical chemist; I am a fellow of the Chemical Society, and have had great experience. I have studied the question of the diffusion of gas; it is a well-known property of that fluid. All gases diffuse with a peculiarity to each of them. I am also well acquainted with the tendency of gas to explode when mixed with a certain proportion of air. Before making any experiments in this case, I was practically acquainted with that quality in gas. I confirm the statements of other witnesses as to the proportions in which the explosive mixture is found. It ranges between 4 and 18 of air to 1 of gas. Those are the limits within which it ranges; 4 of air and 1 of gas, there is no explosion; 18 of air and 1 of gas, no explosion takes place; but between those limits, gradually, as you change the proportions, explosion takes place with the maximum of from 10 to 12 of air to 1 of gas, which proportions produce the most violent explosions. The proportions I have given are those of ordinary coal-gas; with purer gas, no doubt, the proportions would vary. I agree with the last witness as to the result of the experiments in Wood Street. We did not use a very great pressure, nor an orifice of 1½ inch diameter, on account of the annoyance which it would have caused in the neighbourhood. I afterwards attended the experiments made at Uxbridge, where I understood that all things were arranged practically as in Wood Street at the time of the fire. After having tried the experiment with the hole in the wall, 14 inches by 8, we diminished the size to 6 inches by 5, by blocking it up with bricks. With the larger hole, the gas ignited on the other side of the wall at a distance of 6 feet, roughly measured; and, when the hole was contracted, it lit at 5 feet 6 from the wall. It is obvious from this, that the gas was projected through the hole with a velocity due to the pressure in the main. Of course, the whole did not go through; it ascended.

By the Court: There was a difference of half a foot only in the distance at which the gas ignited in the two holes.

By Mr. Karslake: I witnessed the experiment made when the hole was stopped with tow. I knew before the experiment that no porous body would prevent the passage of gas; it would retard it, but not prevent it. I ascertained before the light was applied that the hole was properly stopped, and that no gas could pass through between the tow and the wall itself. I ascertained that it was fairly stopped simply by looking at it; there was no other experiment necessary to satisfy myself on the subject. I should say, as far as I can recollect, that the gas ignited in less than a minute. The effect was, that we heard a ramping noise; within a few seconds, the flame was on the other side of the wall, with a flash which caused a sheet of fire to rise some six feet high, which at once rushed to the hole in the pipe. The tow which was used was such a ball as is sold in the shops, and which in that form presents a more compact and impervious mass than if you were to take a bundle of tow and push it in. I agree with the last witness, that the escape of gas from a burner would not be sufficient to account for the explosion in Wood Street. I calculated roughly, that the area of the basement story was about 4000 cubic feet. I have not the vestige of a doubt that the gas came from the hole in the pipe, and formed an explosive mixture in that chamber. I witnessed the experiment for the purpose of ascertaining, when the glass doors of the basement were closed and the doors below the grating were open, whether there was an indraught into the building. I found there was a considerable indraught. It must be the case; and the first words I said on going into the establishment were, "It would surprise me if it were otherwise."

Cross-examined by Mr. Bovill: Just as in a fire-place in ordinary circumstances, I should expect the smoke to go upwards. I should expect if a chimney-shaft were hot from a fire being constantly kept in, that the smoke would ascend, but if the chimney had been for a long time without a fire, it would not surprise me at all to see the smoke come down. A chimney, however, is not in the same condition as the chamber. The hole in the wall at Uxbridge was 14 inches vertical, and 8 inches lateral. The thickness of the wall was about 14 inches. I do not recollect the thickness of the wall of the house in Wood Street. I was not surprised to find the gas go through the wall, when the hole was stopped with tow. I was surprised at the rapidity with which it traversed that solid mass, but I certainly expected it to go through, or else *cui bono* the experiment at all. I knew of my own previous knowledge that no porous body will prevent gas from passing. It depends upon how it was done, whether it would have made any difference if the tow had been tarred. If the ball was soaked in tar, or any other sticky substance, it would be much more impervious—perhaps altogether impervious. I should prefer mortar. We reduced the size of the hole in the wall by putting in bricks loosely, and then covering them with some mortar or lime, which was used for luting the retorts, in order to fill up the interstices: I saw the tow put in after that. There was as much force used as a man could use for the purpose. The hole was not interfered with as to size, and the tow was firmly put in. I looked, and saw that the hole was quite obstructed by the tow. I trusted to my eyes; they would not tell me how hard it was put in, but there are two ways of looking at a thing—a careful and a careless way. I looked carefully. I did not test it in any other way. I touched the tow, and pressed it with my hand before it was put in.

Re-examined by Mr. Karslake: The experiment was a perfectly fair one.

Dr. *A. W. Hofmann*, F.R.S., examined by Mr. Hawkins.

I have for many years turned my attention to chemistry, and am acquainted with the properties of gas. I have heard the evidence of Dr. Normandy with reference to those properties, and as to what makes the most explosive mixture, and I agree with him. I witnessed the experiments at Uxbridge of which he has given an account.

Mr. Hawkins: Have you anything to add to his evidence?

Witness: Of course, in witnessing experiments, two persons see in some respects many things differently. In the main, I should think I have seen what Dr. Normandy has described in details. I may possibly have varied in my observations.

Mr. Hawkins: Did you observe the tow that was put in the hole?

Witness: I was standing at the time on the wall, with the view of seeing what took place on both sides, and I confess I did not examine carefully the manner in which the tow was put in the hole. Owing to the position in which I was standing, I am unable to say anything particularly on that point. I wanted to see at what distance the gas took fire on the other side of the wall, and so I had placed myself in a position in which I could observe the orifice in the pipe from which the gas issued, and likewise the torch by which the gas was lighted. I observed when the gas ignited, that the flame ran back to the pipe.

Cross-examined by Mr. Bovill: All these experiments require to be watched with a great deal of care. It is necessary to have not only two eyes, but eyes on both sides of the question.

Dr. *Miller*, examined by Mr. Holland.

I am a professor of chemistry at King's College. I have heard the evidence of Drs. Normandy and Hofmann, and I agree with what they have said in the main. I was present at the experiments at Uxbridge, and saw the tow put in the hole in the wall.

Lord Chief Justice Cockburn: Unless you dissent from Mr. Bovill's proposition, that tar makes all the difference, the experiment of the tow is of no avail, because the evidence of the defendant's witnesses will be that it was with tarred tow they stopped the hole. If Dr. Normandy is right, that tar would make all the difference—that it would make the tow impervious—the tow experiment may as well be dropped. [To Dr. Miller.] Do you agree in this, that gas issuing from one or even two ordinary burners in a space like this basement would not supply a sufficient quantity of gas, in proportion to the atmospheric air, to cause an explosion?

Witness: It is quite impossible, according to the statements which have been made.

The learned counsel consulted together at this stage of the proceedings for about half an hour; at the end of that time,

Mr. Bovill said: Will your lordship allow us to go into your room? Both sides are desirous to ask you one question.

Lord Chief Justice Cockburn: Certainly.

Mr. Bovill and Mr. Hawkins left the court with his lordship. On their return into court,

Mr. Bovill, addressing the jury, said: Gentlemen, I am happy to inform you that, in consequence of a communication that has passed, we have made an arrangement, which has been submitted to my lord, and which, I trust, will be satisfactory to everybody connected with the case. The terms we have arranged are for the payment of the sum of £25,000 by the defendants by certain instalments, which is less than half the amount claimed in any view of the case. We have stated the terms to his lordship, who approves of the same.

Lord Chief Justice Cockburn: I must say I think this is a result which will be satisfactory to every one; and both parties I think deserve commendation for having assented to such terms of arrangement. With regard to how this explosion and fire originated, I think, after the evidence we have heard, and from what I know in the main would be the evidence given on the other side, it is not possible to entertain the shadow of a doubt, for there are certain scientific facts and data which cannot be gainsaid or contradicted. The suggestion made that a burner or burners left unturned in the morning could have caused this explosion, is as much out of the question as it is possible to be. But, with regard to the question whether there was negligence on the part of the company under the circumstances, that is one that is fairly open to discussion, and upon which there may be a difference of opinion; and I do not say which way the verdict of the jury would be likely in the end to be. Looking at all the circumstances, I think the defendants have acted most properly in agreeing to pay a certain amount; and I think also that the plaintiffs, who I understand to be substantially the insurance companies, though nominally they are the parties whose property was destroyed, have acted very wisely, and are very much to be commended for having moderated their demands, and accepted a smaller sum by way of arrangement and compromise. On the whole, I think the arrangement is a very satisfactory one to all concerned.

Mr. Hawkins: I may mention that this not only disposes of the two actions which had to be tried, but also of Blenkiron's.

The agreement entered into was as follows:—

STURGEON AND ANOTHER, *versus* BLENKIRON AND MORLEY,

THE GREAT CENTRAL GAS CONSUMERS COMPANY, AND CLAIMS OF THE INSURANCE COMPANIES.

Juror withdrawn in each action; certificates for special juries. The defendants to pay £25,000, and costs to be taxed in each action. The costs to be paid within six months from this date. The defendants to pay £2500—part of the £25,000—in six months from this date; £3500—other part—in twelve months from this date; and the balance of the £25,000, by four equal instalments, on the 1st day of July in each of the following years—namely, 1863, 1864, 1865, and 1866.

Judges Order, or Rule of Court, July 4, 1861.

(Signed) H. Hawkins, for Plaintiffs.
W. Bovill, for Defendants.

CITY OF LONDON QUARTER SESSIONS.

GUILDHALL, SATURDAY, APRIL 13.

(*Before the* RECORDER.)

THE CHARTERED GAS COMPANY, *Appellants*, *v.* THE PARISH OF ST. BOTOLPH, BISHOPSGATE, *Respondents*.

Mr. Clerk and Mr. Norman appeared for the appellants; and the Hon. G. Denman and Mr. Croom for the respondents.

Mr. Denman said, before his learned friend (Mr. Clerk) proceeded to open this case, he wished to call attention to the circumstances which had transpired with reference to it. The appeal was lodged against a rate made in the year 1858, upon the Chartered Gas Company. That company had three stations—one at Westminster, one at Brick Lane, and a third, the subject of this appeal, at Curtain Road, supplying the parish of Shoreditch. At the time this rate was made, an appeal was lodged against rates made in Westminster and Clerkenwell, and it was agreed that this one should stand over until after the others had been decided. That case was referred to Mr. Heggins, and the arbitration lasted for a considerable period. At length, a decision was come to, by which the rate, made by the parish, was reduced from £9000 to £7000. The gentleman by whom he was instructed had kept from time to time, earnestly inquiring for the result of that appeal, and saying that the parish of St. Botolph would willingly abide by its result. At last, he received a letter from the appellants, in which they referred to the fact that the proceedings had, from time to time, been postponed, and that they had stated a case with the view of obtaining a judicial decision upon the correct principle of assessing manufacturing companies.

Mr. Clerk said the case which was to come before the Queen's Bench was to ascertain whether the company were to be rated upon the structural value or otherwise.

The Recorder asked what was the application of Mr. Denman?

Mr. Denman replied that there was an understanding that the present appeal should stand or fall by the other.

The Recorder: How can it? We are bound by the actual figures in the case.

Mr. Denman: We are quite willing to admit that, if there was a reduction made in the former case, there ought to be a reduction here.

The Recorder: But it may be, for anything that as yet appears to the contrary, that each party was to be guided in his conduct by the circumstances of the case.

Mr. Denman: I am quite aware that that is what they say. But our understanding was a totally different one. Besides, from time to time, we kept applying to them upon that understanding, and they did not protest against it.

The Recorder: It is quite consistent with the view, that each party was to be guided by that decision. You must show your agreement to that effect.

Mr. Clerk said there was no other course open but to proceed with the case. This was an appeal against a poor-rate, made on the 28th of September, 1858, by the overseers and others of the parish of St. Botolph, Bishopsgate, and the appeal against that rate was made on the 15th of December in the same year, and had been respited from time to time ever since. About three years ago, there was a very strong impression, on the part of many of the gas companies and water companies of the metropolis, that they were being rated upon an erroneous principle; and there was also a strong impression, on the part of the courts, that both gas and water companies ought to be rated upon the structural value of their property, and not by going through the balance-sheet, and ascertaining what their profits might have been. In the year 1858, the Chartered Gas Company contended, as other gas companies were now doing, that they ought to be rated, not upon the value ascertained by their balance-sheet, but upon the structural value of their property; and that was the question raised in the case of the Chartered Gas Company and the parishes of St. Margaret and St. John. That was referred to an arbitrator, in order that he might state a case for the Court of Queen's Bench; but nothing so absurd was ever said, as that whatever reduction in the figures the arbitrator might think should be made in the case of St. Margaret, should also be made in that of St. Botolph. Why should any parties be guided by what the overseers might have overcharged in the parishes of St. Margaret and St. John? The overseers might have made a very considerable overcharge in those parishes, and the overseers in St. Botolph would naturally consider it very unfair if they were to be bound to submit to that overcharge, and its subsequent reduction. What the company agreed to be bound by was, the decision which the Court of Queen's Bench should come to upon the principle of the rating. No decision was come to upon that point, because, upon an examination of the facts, it appeared that the company ought to go upon their balance-sheet, and not upon the structural value of their property. Now, he proposed, in ascertaining the rateable value of the Chartered Gas Company, to go into the balance-sheet of that company, and out of that balance-sheet to show upon what proportion of the profits they could pay, and upon what the rateable value was to be ascertained. The Chartered Gas Company had three sets of works. There were: first, the works at the Horseferry Road, which supplied part of Westminster and the parish of St. James. No part of that gas came into the parish of St. Botolph. Then, there were works at Brick Lane, which supplied another large district; and the company had also gas-works at Curtain Road, which supplied St. Botolph. The whole of the rateable property they had in St. Botolph, consisted of certain mains and pipes used for purposes of distribution; and, upon calculating the length of these, it was found that the total acreage occupied by the company in the parish was the one-sixth part of an acre. Prior to the 28th of September, 1858, that one-sixth of an acre—that was to say, those mains and pipes in the parish, were rated at the sum of £57.

Respondent's Attorney: No, no.

Mr. Clerk said he had been so instructed; namely, that in the year 1857, the land occupied by the company in the parish of St. Botolph was rated at the sum of £57, but, that in that year, the parish thought fit to raise that rating from £57 to £838. At first, £57 was considered the rateable value of that one-sixth of an acre occupied by the mains and pipes of the company; but, when he came to investigate the accounts, and to investigate them strictly, upon the principle laid down by the Court of Queen's Bench, it was extremely difficult to support even that rating of £57 per annum for that one-sixth of an acre.

Respondent's Attorney: It was only £23. 10s.

Mr. Clerk felt much obliged for the correction. He had it stated on his brief that it was £57, but now he was very properly reminded that it was not £57, but only £23. 10s. He now came to the consideration of the balance-sheet; and really after the mode in which these questions had been discussed, there could be very little difficulty in dealing with this part of the inquiry. It was a matter that might be proved from the books of the company. Now, the books of a large company were drawn out in such a manner as that the amount of the profit and loss could be easily ascertained from them, what profit they had on their manufacture, and what profit they could pay to their shareholders; and, to suppose that there were erroneous, and incorrect returns and entries in those books, seemed to be one of the most unreasonable suspicions in the world. He had heard such things suggested before now; and, if it were repeated on the present occasion, all he could say was, that the books of the company would be produced, and he would turn to the figures, the accuracy of which would be fully borne out. The principle of ascertaining the rateable value was really very simple. They first ascertained what had been the gas rental at the whole of the works, at the works at the place of manufacture at Curtain Road, and what the company had received for gas in the whole district supplied from those particular works, because every parish was entitled to a proportion of the rateable value of the works as a whole, in proportion to the quantity of ground the works occupied in the parish. Having ascertained the whole of the gas rental, you added the amount of products which was also gained by the company from carrying on the business. Then they would have got the gross receipts which the tenant would have on the year. The best thing was to ascertain the cost of manufacture. What cost had the tenant been at? How much had he been out of pocket? That, deducted from the gross receipts, left the gross profits of the trade. Those gross profits involved two other points—the rent he would have to pay, and also the interest of his capital, and the profit to himself as tenant. When these things were ascertained, they would have to be taken from the gross profits, after which there would be a reduction for insurance. Besides this, mains and pipes were subject to deterioration, and, therefore, a sum must be put by annually for the purpose of reproduction. The proceeds were liable for these reductions, the whole of which he believed he had stated. And now he would proceed to glance at the actual figures, premising that with reference to the receipts of any joint-stock company they could only look at the published accounts. He had already stated that the rate appealed against was made by the parish of St. Botolph, in September, 1858. If he were to take the accounts of 1858, 1859, or 1860, they could have nothing to do with the rent of the tenant in 1857. He would, therefore, take the balance-sheet of 1857, and calculate his rent from that balance-sheet. This had been the case with reference to the Britannia Company some years ago, when it was decided that the balance-sheet of the previous year was the one that ought to be taken.

The Recorder: As a main guide, no doubt.

Mr. Clerk would suppose a case. Suppose that there was an increase in the business of the company in 1856 and 1857 over and above what it had been in 1855, it was clear that the parish would not act unfairly towards itself in such a case in taking the balance-sheet of 1857, if there was no reason to believe that there would be a further probable increase in 1858. Now, 1858 was rather a less prosperous year than 1857, but he would take the balance-sheet of 1857 as the one immediately preceding the year when the rate was made which was now appealed against.

Mr. Denman: I think it right to mention at once that this is rather an unfortunate circumstance which my friend has just mentioned. He says that he is about to take the balance-sheet of the previous year to 1858. It so happens that the year 1858 was an exceptional one, and that the receipts of the company, because of some circumstances or other, were less in that year than in any other. We inferred, therefore, that the company would rely mainly on the figures for 1858, and we have accordingly prepared our estimates, and are ready to meet the case on the returns for that year, although they would be most against ourselves. It may be too late now to protest against the course my friend purposes to take; but I think it right, on the very first intimation my friend gives that he is going to proceed on the balance-sheet of 1857, to state that we may be in considerable difficulty because we have made our estimates upon the basis of 1858.

The Recorder: It appears to me that the year 1857 is the one that ought to be taken.

Mr. DENMAN: But, then, we have made all our calculations on 1858.

The RECORDER: I cannot help that. You seem to run in parallel lines without any chance of meeting.

Mr. DENMAN: We have nothing to do with 1857.

The RECORDER: Would there be any objection to appoint a person to look into the figures, and ascertain their amount? No two persons could differ upon the figures.

Mr. CLERK: That is a very reasonable suggestion; but I am given to understand that my learned friend's clients were informed of the amount of all our receipts and expenditure in the year 1857.

Mr. DENMAN: They never gave us any information of what their receipts were in the parish at all.

Mr. CLERK: I apprehend it was given to them in this form—the whole of the receipts of 1856, 1857, 1858, and 1859.

Mr. DENMAN: I repeat, that the receipts of the parish were never given to us at all.

Mr. CLERK: The receipts in the parish will be given.

Mr. DENMAN: That is the sole question.

Mr. CLERK: If that is the sole question, the receipts will be given.

Mr. CROOM: We have never had them at all.

Mr. CLERK: No; nor we do now intend that you should have them for all the parishes. We have already told you that the quantity of apparatus in St. Botolph is one-fourteenth of the whole.

The RECORDER: That is a most important part of the inquiry.

Mr. CLERK: It is a matter of mere rule of three. The total gas rental of the Curtain Road district—or, in other words, of the parish of St. Botolph—will appear fully from the books. My learned friends are asking, not for their own information, but for that of others, what is the gas rental of the other parishes?

The RECORDER: You ought to give the total distribution, and the amount of the mains in the other parishes, and that you ought to furnish to Mr. Denman.

Mr. DENMAN: The policy of certain companies is to give as little information as they possibly can.

The RECORDER: But our policy, sitting here, is to obtain all the information we can get. It would be by far the best course to get the figures agreed upon.

Mr. DENMAN: They have given us the expenses of the year, as they say, and in those expenses they have included, in the first instance, without separation in any way, a considerable quantity of wear and tear of plant. They have, in fact, mixed up together the expenses of wear and tear with renewals.

Mr. CLERK: It is a very inconvenient mode, on the part of my learned friend, to be interposing in this manner. As 1858 and 1859 were exceptional years, and as then a great restoration of retorts was required, that is the very reason why these years should not be taken. As there is a burthen thrown upon the court—the burthen of taking down these figures—I will not object to the inspection of our books by any impartial accountant. My learned friend was engaged in the case of the Imperial Gas Company, and there an objection was raised, that the entries in the books had not been verified. As I have no doubt the result of their accuracy will be established, I have no objection whatever that an impartial accountant should take our vouchers, go through our books, and see whether they are correctly kept, and do all that work which the court would have to deal with here if the case were regularly gone through. Of course, that will not determine the question whether we are entitled to the deductions to which we lay claim, but it will facilitate our proceedings.

The RECORDER: This impartial gentleman of whom you speak should not only have the right of inspecting and verifying the accuracy of the accounts, but Mr. Denman should have the power of defining such matters as he may think important, with the view of guiding the court to the proper valuation.

Mr. CLERK: Yes, we agree to that.

Mr. DENMAN: But we cannot agree to it. This rate has stood over for a very long time, and the decision respecting it will not settle anything else. Palpably, it is not in itself so important as to justify the expense of employing an accountant. We ought to have been furnished with those most important figures regarding the receipts. We have not had these; and, also, it so happens that, in their absence, we have been so unfortunate as to make all our calculations for the year 1858. Therefore, it strikes me that the best thing would be to postpone this question until some future day, when we shall have all these documents and estimates furnished to us.

Mr. CLERK said that if his learned friend would refer to the letter of the company written in March last, he would find that there was no wish on their part to withhold any information, that they were willing to furnish him with an account of the receipts and expenditure of that portion of their property situated in the parish of St. Botolph, not only for 1858, but for 1856, 1857, and 1859. The further information now sought was only asked for yesterday, and he believed the parish were in possession of it. The company had told the parish that the value of their structural property was one-eighteenth of the whole, whereas, they now found it was one-fourteenth, and that the parish were entitled to one-fourteenth upon the actual valuation.

Mr. DENMAN said, he would not admit that the year 1857 was to be binding to all intents and purposes.

Mr. CLERK would not ask his learned friend to be bound to anything. The total receipts in that year were £25,512, including the rent from the hire of meters. The gas rental from the Curtain Road district was less in that year than it had been in 1856. In consequence of the inefficient state of part of the works at the Curtain Road station in 1857, a portion of the district which had been supplied from Curtain Road was handed over to the Brick Lane district, and was supplied from the Brick Lane station, and not from the Curtain Road station. Of course, a tenant on taking the works, took the district subject to its charges; and, if he supplied a lesser district in 1857 than he did in 1856, he must expect a reduced receipt. There was, on the other side of the account, a quantity of coals, and materials used for purifying the gas, and also workmen's wages, and the wear and tear of retorts, taken upon an average of seven years. Retorts lasted more than one year, and, therefore, the expenditure made in restoring them in any one year ought not to be charged. The plan pursued then was to take an average of wear and tear of them for seven years. Then, in the actual expenditure were included the cleaning and repairing the public lamps, the stores, and the repairs of works and mains. These were the actual annual repairs; and, though there was an excessive amount of them done in 1857, yet the total expenditure in that year would be shown to be less than it was in 1856. There were certain other items which were less in 1857 than they had been in the previous year. He might mention that there was competition in the parish of St. Botolph, that the Great Central supplied gas in that parish, as well as the Chartered. He knew not whether there would be any dispute on the next item of charge—that for directors and auditors.

Mr. DENMAN: Certainly, there will.

Mr. CLERK said, it seemed to be the order of the day to dispute everything. Now, although this was a large company, having three separate stations, they had only put down the sum of £283 for directors and auditors at the Curtain Road. The payment of directors and auditors was a matter which had been discussed over and over again, and he certainly thought £283 a very reasonable amount for the directors and auditors of the company at Curtain Road. Then, there were items down in the account for salaries and commissions, and also for rates and taxes. The law expenses were small; but, now that St. Botolph had taken up the present hostile position, it was probable that this was an item which would figure more largely in future accounts. Then, bad debts were mentioned, and a total was made out of £23,060. That, taken from the gross receipts, left a balance—a gross product for 1857—of £2451. The next point was to ascertain from that how much of it was rent. How much had the tenant a right to receive as profit to himself as a trader, and what was the rent? The tenant's capital in this case was found to be £12,000.

Mr. DENMAN: £15,000 you told us.

Mr. CLERK said, that as the business of the company had fallen off at Curtain Road in 1857, compared with what it was in 1856, and as less gas had to be made, the company would have to carbonize less coal, and hence less capital would be required. Now, £12,000 was about half the expenditure of the tenant during the year. There was a stock of coal to be bought, in order to manufacture the gas. Then, there were stores for purification, and during the year the tenant would have to keep up those stores. In about one-third of the year, his receipts would begin to come in; in other words, after about one-third of the year was over, he would have a certain portion of his capital returned to him in the shape of receipts. Until then, he would be obliged to have other means in hand to pay his rent, and for the purpose of meeting any extra expenditure. Therefore, a capital equal to about what would be required for half the year, was about the smallest capital that a tenant would require to have to carry on a business of this description; and upon that amount interest must be calculated. He would prove by the evidence of a gentleman, who was the lessee of gas-works, that a business of this kind could not be carried on with less than half a year's expenditure in hand. But, perhaps, this was a point which would not be disputed.

Mr. DENMAN: Oh! yes, it will.

Mr. CLERK said that 5 per cent. was the ordinary interest allowed on capital, and 10 per cent. as profit on capital. The Grand Junction Canal allowed 20 per cent. In all the other companies, 15 per cent. was allowed. This being so, the sum of £1800 would have to be deducted from the £2451, leaving £650 as the rent which the tenant could afford to give for the Curtain Road station. He thought he had taken a low per centage, because very many portions of the works were destructible. Let it not be supposed that the gasholders could not be destroyed by fire, for they could. If the gas escaped, great damage might be done upon the iron; and, therefore, there were many parts of extensive works of this sort which must be insured, or calculated as insurable. There were, also, some things wearing out very fast. There were houses, which now required more than ordinary repair. The mains and pipes were in themselves very destructible. He took these at an average of 1 per cent. The houses, and plant in those houses, and the mains were all supposed to last a certain time. He took these also at 1 per cent. They must have a fund for ultimate restoration. As the total value of the property, then, was £44,500, he took it at 1 per cent., because that was the per centage determined in the Clerkenwell case.

Mr. DENMAN protested against his learned friend quoting the decision to which he was now referring.

Mr. CLERK contended that he had a right to quote it, when the question was—What was the fair deduction to be made as regarded any gas company in the kingdom? How long would a main last when it was new? Why not consider what was its original value, and what outlay would be required in order to restore it again? It was true that the Clerkenwell case did not govern anything; still, although he believed he had a right to claim a per centage of 1½, he would, for the sake of peace, be content to claim only 1. That would give £571, which, deducted from £641, would leave for the year 1857, as the net rateable value of the Curtain Road station, the sum of £70. 9s. 4d. The question was—How was that to be distributed? The simple mode of distribution was that laid down in the Cambridge case—viz., that of structural value. He should not quarrel with any other mode of distribution which might be practised. It was quite immaterial to the company what the mode might be, provided that the same principle was applied to all other parties for ascertaining the net rateable value of the whole. If it were distributed according to the proportion of the structural value in the parish, they would take it at one-fourteenth, and that would give them the net rateable value for 1857. It must be recollected, however, that, in consequence of the state of the works, a considerable quantity of the gas obtained in the Curtain Road district was brought from other stations. If they took the average between 1856 and 1857, it would give the rateable value of the whole as £88, although in 1856 it was £171. 9s. 4d. He now proposed to establish these facts in evidence; and, if there were any figures that required to be explained, that explanation would be given by the witnesses; and he believed that every item in the accounts would be found to be correct.

Mr. *Thomas Bush*, examined by Mr. NORMAN.

I am the chief accountant of the Chartered Gas Company. It is part of my business to receive the returns of the general income and expenditure of the company, and to enter them in the ledgers. The total amount charged for gas distributed from the Curtain Road station for the year 1857 was £21,118.

By Mr. DENMAN: I got that from several returns. These returns are made to me by Mr. Watts, the clerk who has the management of the light accounts. I sum up the returns. I did that before the appeal was brought. The returns were prepared to pass the auditors at the time. I cannot decide how much of them was for public and private lights.

Examination continued: The item for coke and other products is £4394. 9s. 7d. The coals were £13,034. 7s. The materials for purification, £449. Workmen's wages, £2614. 2s. 9d. The wear and tear of retorts, on an average of seven years, is £1580. 8s. 5d. Lighting and cleaning, £558. 12s. Stores used in carrying on the work, £570. Repairs of works and mains, £1344. 11s. 11d. Meters, £49. 16s. 2d.

The RECORDER: What do you mean by "meters" (stores)?

Witness: Stores used about the works. Wages of men, £169. 9s. 8d. Directors and auditors, £283. 16s. 6d. This is not all we pay our directors and auditors, but this is the proportion we pay for the Curtain Road station. Salaries and commissions, £1216. 1s. 8d. Taxes, £574. Law expenses, £55. 7s. 8d. Bad debts, £423. 9s. 2d. That makes a total of £23,060. 16s. 8d., showing the gross profits of that year to be £2451. 9s. 4d.

Cross-examined by Mr. DENMAN: I got the item of coals from Mr. Upward. Mr. Musgrave supplied the particulars of the expenses of purification. Mr. Upward gives the workmen's wages. The wear and tear is got from the storekeeper. The return for 1857 is made by Mr. Musgrave. The average of seven years, ending with 1857, for the wear and tear of the retorts, is £1580. Upon this item alone, in 1857, there was an increase over 1856.

The expenditure of 1857 might have been £1050 greater than the expenditure in 1856. The expenditure of 1857 is put down at £1580. The expenditure of the year previous was £1430. That is £150 less. If the average of seven years is increased £150 in one year, there must have been an addition, in 1857, of £1050. It is £1050, in those last seven years, over the average of the previous seven years. The expenditure was £1048 in the year 1850. By leaving out that year, and taking in 1857, I raise the average by £1050. The expenditure in 1857 was £2094. That is very much above the ordinary expenditure of the year. I imagine there would be more restoration of retorts going on at that period. I cannot, at present, lay hold of any year in which it was so high. The average in 1856 was £1430. The highest expenditure in any one year was £1891. That was in the year 1856. That was the highest before 1857. The highest before that was £1887 in 1853. I did not go into the circumstances which caused this. I attend only to the figures. The items for lighting, cleaning, and repairing the public lamps, is made up from the stores used about lamps, which I get from the storekeeper. The wages I get from the weekly wages bills. The wages bills are signed by the superintendent. I cannot tell what number of public lamps there are. I have no books here which show that; I have no doubt there are such books, but that does not come under my department. I have never asked for these books, to verify my statements. The item, "Stores used in carrying on the works," is an actual expenditure, and consists of a great number of different items supplied by the storekeeper. In the accounts for 1856 and 1857, I included something for renewal of works. I have drawn no distinction between those sums expended on ordinary repairs and those expended on new works. The books are kept so as to show the total expenditure, including repairs of works. New mains would be deducted. I mean by "renewals," restorations; and, in such a case, it would be charged in the accounts. If an old main of 12 inches is taken out, and a new one put in, that is included in the repairs of the year, if it is the same size. In the item of £1344, I cannot tell how much is added for new and old mains. Mr. Clarke, the inspector of new works, can tell that. That £1344 is made up from the store accounts. I cannot tell, even with the aid of that account, how much is carried to new and old mains. The pipes are charged specially. By looking at the word "pipes" only, I cannot tell whether they are new or old ones. The figures for that item, I got from the inspector of mains. The item for "pavements" was got from Mr. Johnson, the surveyor of mains. A portion of these pavements includes various elements, but not as it is left now, because credit is given for an enlarged pavement. Pavements would have credit in certain cases. "Stores" are fittings for the meters. The items for wages of men, repairing, and fixing meters, are got from the wages bills. That includes new meters as well as the repairing of old meters. That account is furnished to me in a division in the wages bills. The directors and auditors are proportioned according to the rental; that is, the rental of the Curtain Road is compared with the Horseferry and Brick Lane stations. The total rental for the Horseferry I have not got here. The rental for the whole is £181,286. The proportion of the sum charged for directors and auditors is £283. The salaries and commissions are sums actually paid, not calculated. A proportion would be charged for those officers and men who discharge duties at the other stations. I have not the figures here for the amount of the separate staff at the Curtain Road station.

Mr. Denman: I understand, that the proportion of allowance given to the auditors and directors at Curtain Road, when worked by the rule of three, as compared with the other stations, gives £282, so that we cannot quarrel with the amount given to them there.

Cross-examination continued: We have separate collectors at each district. Mr. Upward is the general superintendent. We have allowed one-third for his salary for the Curtain Road. We have two eastern stations—this one, and one at Brick Lane. Brick Lane is the largest. Mr. Upward is paid in proportion to the rental of each. My own salary would be in proportion to the rental. The item for bad debts for 1857, was supplied by the chief clerk. They amount to £130 more than the year before. That was an unlucky circumstance. The bad debts for that year were a good deal more than for the year 1858, or 1859. In 1855, the bad debts were £575. In 1854, they were £328. That would be £450 as an average of the two years. In 1853, they were £334. None of these years would bring them up to £423. Those debts are put down as bad when they are considered irrecoverable.

Re-examined by Mr. Clerk: Most of the details I have been examined about I received from other persons. In the capital account, I have the amount charged in 1857, in respect to mains. It is about £200. There is £104. 19s. 1d. and £118. 17s. 7d., making £323, carried to capital. Mr. Johnson tells me what has been expended in regard to pavements, as applicable to new works; that is to say, the new works are deducted from the profit and loss account of the year.

Mr. *Alfred Upward*, examined by Mr. Clerk.

I am the superintendent of the Brick Lane and Curtain Road stations. The quantity of coals carbonized in 1857 was 14,657 tons. The wages for the Curtain Road station, in 1857, amounted to £2614; that is for manufacturing wages. There are other wages for repairing and fixing meters, and for wear and tear of retorts; but these are items you will have to apply to the "stores" for. The amount for repairing and putting in retorts varies, as sometimes they are burned out, and sometimes they do not last so long as at other times. The retorts now in use do not last so long as seven years. Iron retorts do not last twelve months; clay retorts last longer. We were using iron retorts in 1857, at the Curtain Road station. The average duration of them would be nine months, varying, of course, a little as to the quality of the iron. I cannot say how much of the item of £1344 is applicable to new and old works. There were no new works or renewals done in 1857.

Cross-examined by Mr. Denman: Mr. Bush puts the money value on the accounts. He pays the accounts. He would get the money value from his own books, and the quantities from me.

Mr. *Bush* recalled, and examined by Mr. Denman.

Mr. Upward supplies me with the quantities. I take each separate account down, and the figures are taken by me from the invoices. I have not any of the invoices here. I have not deducted the discount which is received. I I cannot say what the discount would be upon £13,034 worth of coals. The discount upon the whole of the works might be about £1500. Sometimes we get 1¼ per cent., and sometimes 2½. We never take credit; we always pay cash, and the discount varies. Some people do not give any discount at all.

By Mr. Clerk: I cannot exactly say what is the highest per centage we ever get upon coal, as the contracts vary so much. The contract price the coals stood in our books was £13,034. There are items in the account in which discount is charged.

Mr. Clerk said, as there was very little chance of concluding this case that day, Mr. Bush would go through the accounts, and answer these questions more particularly at the next hearing.

Mr. *Upward's*, cross-examination continued: The total amount of £21,118 was for gas distributed throughout the whole of the district from the Curtain Road works. I believe that, to a very trifling extent, there was gas supplied from other districts in 1857. I cannot positively say what quantity without looking at the books; but it was to a very trifling extent. The Brick Lane station did not supply 14 million feet of gas in 1857 to the Curtain Road district. I should say not the fourteenth part of that. I do not think there was half a million supplied; but that can be seen from the books. The quantity of coal supplied—13,437 tons— is the quantity used at the Curtain Road station. I am quite sure of that. The item of £2614 for workmen's wages is for stokers, travelling men, and men attending on the works generally. Coal is an exception. It would be for the general wages of men working at the mains. I mean working at the repairs of the mains; but I cannot positively say that that is included. I see no item here charged of repairs of works and mains, and imagine it would come in the other item. I cannot say positively whether the item includes the works in the streets. I supply the weekly sheet to Mr. Bush, and, on another day, I will be prepared with the fact whether that sum includes the street wages. I have already stated that there were no new works or renewals in 1857. I was then speaking of what took place within the walls of the station. I have nothing to do with the value of the coals, and cannot say whether 14,657 tons would cost £13,034. In 1857, we could store a little more than 3000 tons at the Curtain Road station. That quantity would make the station quite full. It is sometimes the practice to put down a larger pipe in place of a smaller one, before the smaller one is worn out. Of the £558 charged for lighting and cleaning public lamps, £448. 11s. 1d. is for wages. There is no reason why the lighting, cleaning, and repairing of public lamps should be a more expensive operation in Curtain Road than in other districts. I am not aware of any such reason. We had but 220 iron retorts at Curtain Road station in 1857. The walls of the retort-house are not connected in any way with the retort-beds. I mean I could pull the one down without pulling down the other. The hydraulic main is connected. We should simply remove the bricks in which it was set—the bricks in which it was embedded—before we took out the iron retort. Then, there are small piers built round them, to carry the next tier of retorts. I cannot tell you what would be the cost of taking out each one of these retorts, and replacing them. We began, in 1858, to change from iron to clay retorts. I am certain that that was the time.

Re-examined by Mr. Clerk: The retorts are set in the brick arches. As a particular retort is worn out, we have to remove the bricks, and then a new one is put in, and the bricks are put round it again. If several are to be renewed, we take down the piers, and it generally happens so. The sum of £13,034 for coals includes the cost of carting the coals to the works, and the labour of men in doing it.

Mr. *Henry Musgrave*, examined by Mr. Norman.

I am the storekeeper to the Chartered Gas Company at their Curtain Road station. I cannot tell the value of the coals carbonized at that station in the year 1857. I have nothing to do with value. The materials for purification cost, in 1857, the sum of £449. The wear and tear of retorts in that year was £1867. 4s. 1d. That will differ from Mr. Bush's return, because the wages would be added to it. The cost of stores supplied on account of the wear and tear of retorts in that year was £1867. 4s. 1d. That, with £227. 7s. 1d. added to it, would give the wear and tear of retorts, including the wages for that purpose. I only know of the lighting and cleaning from the return of the stores. The stores in 1857 were £73. 18s. 11d. The stores used in carrying on the works were £570. 18s. The stores for repairs of works and mains were £1054. 4s. 1d. The repairs of meters were £465. 12s. 5d., which includes meters supplied.

Cross-examined by Mr. Denman: The figures are supplied by me to Mr. Bush. They are obtained from the invoices. I have not deducted anything for discounts. There is no discount allowed for lime: £449. 2s. is the sum actually paid for materials for purification. The coals are received in bulk and accounted for by me as so many tons. In 1857, the wear and tear of retorts amounted to £2094, of which £1867 was for stores supplied, and £227. 7s. 10d. for wages. That £2094 goes to make up the £1580 average. The wages would be taken from the wages sheet. That would, I think, include the £227 for wages. I have nothing whatever to do with the wages. I got the item of £227. 7s. 10d. from Mr. Bush. The difference between Mr. Bush's whole amount, and my stores delivered, would be for wages; and Mr. Bush would get the form and accumulated wages sheet delivered to him every week by Mr. Upward; and, when they are added together, the yearly amount will be ascertained. Each is given under its separate heading. "Retorts" is one heading, and every article is in like manner mentioned. There is the quantity of bricks charged; they are fire-bricks. I am only the storekeeper, and cannot tell how long those bricks would last. The expenditure within the year with reference to retorts is given. As the retorts are renewed, the old retorts would be sold as old iron. I do not call old iron a product. I do not know whether allowance is made to the parish for the old iron. I have put down in my accounts everything I have supplied: £1867 is put down for stores supplied, and nothing is taken off from that for old iron sold. All such things would be arranged at Westminster by the chief accountant. The stores used in carrying on the works, are £570. Those are supplied by me. They are under the head of "Works," and include articles used—such as tallow, brushes, oil, and sockets. Sockets are used for pipes in the works. They are used sometimes to support mains. I cannot say how long they would last. We are constantly changing them. "Sundries" would include a lot of smaller things which do not come under any particular head. They would include a few burners, a piece of indiarubber, and a hundred other things, which I cannot recollect. "Sundry work," as put down in the account, would be for sundry work done on the premises. It would have nothing to do with outdoor work. It would be for repairs required for that year—certainly for nothing new. There is £135. 6s. charged for "Sundry work," but I cannot tell you exactly what it was for. Suppose I pointed a building, it would be included in that word "Sundries." There is nothing to show that this "Sundry work" is applicable in one way or in another. They would come to me for stores, whatever the purpose was. Carriage and lighterage is down for £86, and is an annual charge under the head of "Repairs." The carriage and lighterage would be for certain work that was necessary. The lime charged for was for purifying. The amount of stores would be £73. 18s. 11d. One of the items there consisted of materials for purification, and was the total of all the materials for that purpose which had been used. It was exclusively lime; we do not use oxide of iron. There are £135, £82. 10s., £64. 18s., and £166. 8s., all for lime—in all, £449. 2s. The expenditure upon lime, in 1857, was about £30 more than it was in 1856. I cannot say why that was so, although the quantity of coal carbonized was less. We still purify at the Curtain Road station with lime. I cannot give any opinion as to whether lime is the best purifier or not.

Re-examined by Mr. Clerk: The old retorts are sold as old iron and returned to the office; but, although disposed of by me, they are returned by Mr. Watts. I have no knowledge of how the stores given out by me are employed.

Mr. *Charles Watts*, examined by Mr. CLERK.

Old retorts are sold as old iron, and they are returned to Mr. Bush in the amount of products. I have the whole amount of products for that year, and the old iron is included in the £4394. 5s. 7d.; but what the old iron made separately I cannot say. I am quite sure the old iron is included in that sum. I know the gas rental of the Curtain Road station in 1857, and gave it to Mr. Bush. The whole of the public lamps supplied from that station was 682. In 1857, there was a very small portion of gas supplied from Brick Lane; but no portion was supplied from Curtain Road to Brick Lane. Between my statement of the rental and Mr. Bush's statement, there was about £134 more received from the Curtain Road district, and that was for gas received from Brick Lane. I pay the wages at the whole of the works to all the men, and I send the different pay-sheets to Mr. Bush. I have not one of those sheets here. Mr. Bateson makes out the pay-sheet, and I certify its correctness, and the amount paid.

Cross-examined by Mr. DENMAN: There are several items in respect of which I pay wages. Carbonizing and workmen's wages are paid by me. I cannot say the total amount of wages I paid in the year 1857, as I have not got the account here. I still say that the sum of £4394 includes the produce of the old iron. I hold a memorandum in my hands making up the whole amount, and it includes coal, tar, and ammonia. These are properly called products. Old iron is included in the "Product" return, though it is not, properly speaking, a product. I cannot say now what the old iron produced in the year 1857. It may be £200 or £250. We do not sell old meters. Old iron and old iron pipes we sell. Of the 682 public lamps, there were 162 in this parish. The company received per annum for the 682 public lamps £2796; and for the 162 they received £464. 4s. The amount they received for private lamps in the parish I cannot say; there are very few. By private lamps, I mean private lamps over the doors.

The RECORDER: Can you give us the total receipts in the parish of St. Botolph?

Witness: Including the public lamps, £3444. 15s. 6d.

Cross-examination continued by Mr. DENMAN: I got that amount from the public ledger, which contains a list of all the consumers. I did not supply the return to any one but the directors. It would be handed in at the chief office. It was a regular four-quarter return. I was called upon to make up the return in reference to this question in 1857, when the rate was increased. I have a copy of the statement here. "The annual rental for Christmas, 1857," mentioned in that copy, includes the rental for that year. A great many people living in St. Botolph might have escaped my notice. I ascertained the streets included in St. Botolph. I got that return from the foreman-lamplighter, and went through the books with his return. His return was *seriatim* with the number of streets, courts, and alleys in the parish. Having got the houses supplied in the parish, I took the return extracted from the rental-book, making the same tally, which you have got there. The rental of the parish I got from one of the officers of the parish, as his estimate of the rental; but, of course, his estimate is nothing to us. These statements were made up at the time, with the view of supporting our case. The number of consumers in St. Botolph is 545. The number of consumers in the whole district in 1857, was 3024. That was the number of meters supplied. There might be half a dozen or a dozen who had their own meters, for we supplied meters without charge in the City. They would not have one meter for several houses. The receipts of the parish of St. Botolph in 1856, were £3577s. 5s. 6d.

Mr. DENMAN: Could you tell us the amount in 1858?

Mr. CLERK: I must object to that question, as it does not arise out of the direct examination.

Re-examined by Mr. CLERK: We have a gas ledger at Curtain Road. That ledger shows all the consumers of the district. We received the boundaries of the parish from the foreman-lamplighter. I have not got that paper here, but can send it to the respondents before the next meeting.

Mr. *John Johnson*, examined by Mr. NORMAN.

I am surveyor of mains to the Chartered Gas Company. I am acquainted with the expenditure for repairs of works and mains in 1857. For that purpose, £1344 is charged in the account, and I only know the part of it expended on mains. For repairs of mains, I have two items—£47. 3s. 10d. and £13. 14s. 2d. That was the whole sum expended that year in repairing mains. When mains are put down, if the main is enlarged, a certain portion is carried to capital. If I take up a 4-inch main, and put down an 8-inch main, I deduct the value of the 4-inch from the 8-inch, and carry the balance to capital. That would not appear among the repairs for the year. The amount carried to capital would be the difference between the value of the 4-inch and that of the 8-inch. I deduct from the total amount of labour expended on the streets, the proportion of it belonging to new works, or to repairs of mains. The balance carried to capital would appear as part of the expenses, but the difference would go to the ordinary wear and tear. If labour was expended in altering mains, I would put that to "Repairs" account, and such part as was applicable to new pipes, I would give the total return for. I should tell Mr. Bush, in order that he might put it down, what portion belonged to new work, and what portion belonged to labour. Repairs of pavement were £19. 11s. 11d., and that, also, would be reported to Mr. Bush. The length and size of the mains in the Curtain Road district I have in my possession. There are 33,438 yards of mains, of all sizes, in that district. There are 2050 yards of 2-inch main, 9298 of 3-inch, 6192 of 4-inch, 4140 of 5-inch, 3475 of 6-inch, 4800 of 8-inch, 1053 of 10-inch, 1030 of 12-inch, and 500 of 18-inch. The length and sizes of the mains in St. Botolph are 7473 yards—namely, 995 yards of 2-inch, 2344 of 3-inch, 922 of 4-inch, 1541 of 5-inch, 475 of 6-inch, 1111 of 8-inch, and 92 of 10-inch.

Cross-examined by Mr. DENMAN: I furnish to Mr. Bush the amount for the repairs, and I form the estimate as to how much should go to capital. The £19. 1s. for new work in 1857 was only the proportion of the paving, and that was entirely for new work. The £212. 14s. 8d. is not, I believe, included in the £1344. The total of the £1344 due to mains in that year was £60. 18s. The £212. 14s. 8d. was for new work. I cannot tell you how much of that £212. 14s. 8d. was due for entirely new work. There was also £160 for a 4-inch main that was taken up, and a new one put down in the place of it. I should say the whole of the £212 was entirely for new work. The two sums would come to £372 in that year. I leave £60 18s. for repairs of old mains. The wages will be returned in the wages-sheet; but I have nothing to do with that. The wages will be found in the ordinary wages-sheet; £19. 11s. 11d. is added for the new work. A portion of the £1344 was for taking out old pipes, and putting new ones; but I cannot tell the exact amount. I did not put down the 8-inch pipe because the 4 was worn out, but to increase my works. When I speak of mains, I mean mains in the streets, without reference to services. Some of the papers I produce I got from the last witness, Mr. Watts. The length and sizes of the mains I got from measurement on the maps. The parish supplied, and the district, would be the whole of that portion of the City of London bounded by Middlesex Street and Petticoat Lane, coming down Leadenhall Street, and taking the centre as far as the Bank of England. The proportion of customers bears no relation at all to the mains. The old iron is sold as old material if not fit for use again; but, if fit for use, it is put down again, and goes into "stores." Old pipes are sent into "stores," but do not go into the company's books. When we do charge for putting in new pipes instead of old, money has been actually expended. We do not deduct from that what we have on hand for future use, because we do not charge anything for old stores in the work. We used some old pipe in 1857. We put down 800 yards of 8-inch, in lieu of 800 yards of 4-inch. I have put down some pipes entirely new. What I call new pipes would be pipes where we had none before. Some of the 800 yards might have been old. There have been cases where an old pipe was put down where no pipe was down before; but I do not know that we put down a large old pipe in place of an old small one. A good deal of the 8-inch, instead of the 4-inch, was old material. I have not charged that as an expense.

Re-examined by Mr. CLERK: Besides the 800 yards that were laid down of the 8-inch, other pipes were also laid down. The amount charged for stores was £56. 4s.; but how that was made up I cannot tell. There is an amount credited for the value of the pipe as it lay. The value of the old pipe as it lay was £160. On laying down new mains £372 was expended, and £160 was deducted from that for the value of the old pipe that was taken up. I have got the items of which the £372 is composed; it includes labour, wages, and materials. I have £115 down for the paving. I can give, on a future day, how many old and new pipes were used. I believe a new main is worth considerably more than 8s. a yard.

Cross-examined by Mr. DENMAN: New mains mean entirely new mains. The cost of the work done in Lothbury was £76. 1s. 8d. Lead and yarn are charged for in the accounts, because both are wanted for the joints of the pipes. The lead and yarn is charged at £21. Lead pipes are put down in the place of others, and we charge £24 for these. When we drive a pick through a lead pipe, as we sometimes do, we have to take it away and put in a new one. We charge to revenue all above £160, and some old pipes have been valued by us at that amount. The district of Curtain Road is increasing. The 8-inch mains were put down instead of the 4 to enable us to give a better supply. The 4-inch had been laid before my time, and I have been for eleven years with the company.

Re-examined by Mr. NORMAN: I have no doubt these 4-inch mains were laid forty years ago.

Mr. *Bush* recalled, and examined by Mr. CLERK.

I have here a book which is kept, with regard to the wages of the Curtain Road. I receive different pay-sheets from the different stations weekly. I enter up these sheets into my book of wages. [Book handed to witness.] The total amount paid for wages was £4640, in the year 1857—the difference between £4640 and £2614 having been charged to the several headings in the book. The wages charged in my account is £2614. For repairs of works and mains, the sum of £1344 is made up of wages and stores. I believe that, in the first item of £2614, there is not included wages of the men for repairing works and mains. The items I have read are handed to me, and all I do is to classify, and copy them in a book. In wear and tear of retorts, the sum charged is £227. 7s. 10d.; lamps, £484; meters, £169; "General," £641. The amount of salaries paid weekly is about £60; coal is about £150 weekly. The retorts are £227; lamps, £484. The amount received for the sale of old iron, in the year 1857, in the Curtain Road district, was £161. In this account, that sum is deducted from repairs of works and mains, and the amount is then returned so much less. The total of repairs of works and mains, from which that sum is deducted, is £1506. If Mr. Watts was correct in saying that it is added to the amount of the products, it would be charged twice over; but I have deducted it from the gross amount of the repairs. The account of the repairs of works and mains is made up from the four quarterly accounts of stores, and the wages which I say are charged under the head of "General." When I get the return of the total amount of new work, I deduct that from the repairs of works and mains, and charge the new mains to the capital of the station. The £160, which was the value of the pipes as they were, would, as a matter of course, be charged to the working expenses of the year.

Cross-examined by Mr. DENMAN: The amount paid for wages in 1857, was £4647. There is nothing remains over of the £4647 for wages, which is charged to the capital account. I have given you the Curtain Road station in 1857; then the expenses for coke, tar, and other products would be deducted. On the debtor side, before I bring out my balance of £13,034, I add wages, and in that way the £4647 will appear, in some way or other in the whole of the account. That £4647 was the total amount paid to all the men employed at the Curtain Road station in every way for the year 1857.

The RECORDER: Do you really mean that the money expended in laying down the new main was included in that sum?

Witness: The £1344 charged for works and mains would be increased by £240. The total amount charged for repairs of works and mains is £1710, from which we have deducted £204, and a further sum of £161 for the old stores. These two deductions from £1710, bring out my figures of £1344. That £1344 includes the wages upon these expenditures carried to capital. I cannot tell what is the amount of labour cost in laying mains. [Paper handed to witness.] There are items here of £90. 14s. 6d. and £21. 10s. 4d., charged for labour.

SATURDAY, MAY 11.

Mr. CLERK said on the last occasion, his learned friend desired to have some information in reference to the discounts allowed upon coals and stores, and which ought either to be regarded as an addition to the company's receipts or a reduction of their expenditure. There was also some question upon which further information was required as to wages. He was now ready to furnish the particulars, if it was desired to go into them. It also appeared, that in the year 1857 a certain part of the expenditure upon new mains had been carried to profit and loss, which, upon consideration afterwards, it was felt by the appellants ought not to be so charged, as it was in the shape of renewal. That sum, therefore, amounting to £160 must be added to the gross profits, or deducted from the year's expenditure, which would be the same thing.

Mr. *Bush* recalled, and examined by Mr. CLERK.

We receive discounts on the purchase of coals and stores. For the year 1857, the proportion of those discounts for the Curtain Road station was £214. 3s. 6d. We do not receive discounts on all the coals purchased. I get at the proportion due to this station by taking the whole amount received, and apportioning it according to the rentals of the three establishments.

The RECORDER: It should be according to the consumption,

Witness: The proportion of the discount to the consumption is one of those things that I cannot get at. There are other items which are apportioned in this way—that is, according to the rental, such as directors and auditors; and I have treated this item on the same principle.

By Mr. CLERK: I have analyzed the item of wages; and arranged, under their several heads, the wages expended on coals, coke, tar, &c.

Cross-examined by Mr. DENMAN: The discounts on "coal and stores" include all the discounts received by the company. Some of the coals and

stores are net; I have taken the amount of discount actually allowed, and apportioned it in the way I have stated. The charge for gas at some of the stations is higher than at others. At Westminster, some portion is sold at 6s. per 1000; I cannot say what proportion. I believe that both at Curtain Road and Brick Lane gas is sold at 4s. and 4s. 6d. per 1000. My analysis of the wages book shows that the total wages at that station was £2614. 2s. 9d.

Mr. CLERK: There are wages against coal, and against materials for purification, &c. I understood, from the cross-examination on the last occasion, that my learned friend wanted to know whether the item for workmen's wages included the wages charged under the several heads.

Mr. DENMAN: You begin by showing that the total amount of wages was £2660. 17s., and then you deduct from that a certain sum; what is that?

Witness: For amounts charged under the respective heads.

Cross-examination continued: The wages on tar, breeze, and retorts, have been deducted in the same way. I cannot tell whether those are new or old retorts from the books. If there had been any new retorts, they would have been deducted at the end of each half year. There are no other things included in wages which ought to go to general wear and tear, except what appears here. All the wages are here, under one head or other.

Mr. DENMAN: Is that general wear and tear in the shape of wages only?

The RECORDER: From this paper, it is clearly only wages; it is the amount of wages expended upon the general wear and tear.

Cross-examination continued: This shows all the wages applicable to retorts in that year; the retorts themselves are charged separately. Each half year, the amount applicable to new works is transferred from the expenditure account to capital.

Re-examined by Mr. CLERK: I receive information from the several stations of all the new works during the half year, and it is written off in the way I have stated. The items thus charged against capital comprise wages as well as material employed. In the amount written off, I cannot divide the two. The "wear and tear of retorts" is an average of seven years; and, before that average is arrived at, whatever expenditure was incurred for new works would be deducted. There are discounts allowed upon the purchase of meters, but they are not included in this account, for the reason that meters themselves are excluded altogether. The total amount of discount for the whole of the stations was—upon coals, £474. 5s. 11s.; stores, £1364. 5s. 2d.; making a total of £1838. 11s. 1d. [Witness was further examined upon the items of charge for contingencies and petty cash expenses.]

Thomas G. Barlow, Esq., examined by Mr. CLERK.

I am a civil engineer, have been engaged for many years in the erection of gas-works, and have had considerable experience in all questions relating to their construction and management. I have made an estimate of the rateable value of this company's property in the parish of St. Botolph, and also of the whole of the Curtain Road station. I have been through the accounts of that station, as furnished by the last witness, and have calculated the gross profits of the trade for the year 1857. Taking the figures as they appear in the company's books, I find that in that year the gross profits were £2451. 9s. 4d. I consider that there are certain charges made by the company against revenue which ought to go in reduction of expenditure; and also items of revenue which ought to go to the renewal and reproduction account, which increase those profits to £2840. I deduct £214 from the expenses for the discounts received by the company, and I add £160 for the enlargement of the Leadenhall Street main, which has been charged to wear and tear, and which I conceive should be debited to renewal and reproduction. I also add £14s. 19s. 3d., for depreciation in the value of the ship *Dispatch*, of which the company are the owners; making a total addition of £389, and bringing up the total gross profits of trade to £2840. I estimate that a tenant would require a capital of £12,000 to carry on those works with, and upon that amount I allow him 10 per cent. for tenant's profit, and 5 per cent. for interest making a sum of £1800 to be deducted from the £2840, and leaving £1040, which I say is the rent which he would give for the works at that station. I have estimated the value of the premises, tools, &c., for the purpose of insurance. Excluding the land, I find that the structural value of the premises (exclusive also of stock and tools) is £45,600 including mains, services, and meters. The insurable value of the station, as the whole of these are not liable to be consumed by fire, I take at £25,000. That includes £21,720 as the value of such portion of the buildings, and trade fixtures as I conceive to be destructible, and also £3280 for stock in trade. Upon that amount I consider 10s. per cent. per annum a fair insurable allowance, and that amounts to £125. For the purpose of renewal and reproduction, I allow 1 per cent. upon the £45,600, which is £456, making a total for statutable deductions of £581, and leaving the rateable value of the station and mains, £459. In distributing that rateable value, I take the respondent parish of St. Botolph to be entitled to 1-14th part of the whole. Dividing £459 by 14, it shows the company to be assessable in that parish upon a value of £32. 16s. 7d. In estimating a tenant's capital, I assume that he would require a stock of coals of the value of £2400, a stock of tools, stores, and implements of the value of £1600, and a sum of £8000 to pay sixteen weeks working expenses in the year. I find the structural value of the company's property in the respondent parish to be £3647, the structural value of the whole establishment being £50,600.

Cross-examined by Mr. DENMAN: I have been advising the company for some time past in reference to this, and several other appeals. I do not recollect that I originally advised the company that, in the year 1857, there was a minus rateable value of £21 in this parish. I think it appeared to be so in one year, but I cannot charge my memory. I think, at one time, I took the capital which a tenant would require at £15,000, instead of £12,000. I did so on the principle that the meters, and some other items, should form part of that capital. The enlargement of the Leadenhall Street main was not made with my personal knowledge.

Mr. DENMAN: Do you altogether strike off that item, or only that portion of the cost of it which is due to increase?

Witness: It appeared, from the evidence that £160 was charged to profit and loss under that head, and the rest was carried to capital.

Mr. DENMAN: But what I want to know is, whether you only strike off the increase?

Witness: For the purpose of this account, it may be taken to be carried to capital; but, really and substantially, the £160 is a charge upon renewal and reproduction, for which I allow £456. In estimating that a tenant would require capital in hand to meet sixteen weeks expenses, I have taken into account that during that time he would be receiving money for the sale of residual products. I have deducted the whole of the receipts for products from the expenses in my estimate. Of course, that is not deducted in arriving at the £2451 as the gross profits of the trade; but it is, in arriving at the £8000. In entering upon the works, a tenant would have to purchase the stock of coals necessary to carry them on; and, in addition to that, he must have a sum of money to pay wages, and the different outgoings and current expenses, until he is in receipt of some portion of the rental, and I reckon that he should have it for sixteen weeks. If I had not deducted the products, that £8000 would have been something like £9500. The other part of the £12,000 of tenant's capital is for coals, stores, tools, and implements. Of the £45,600, which I have given as the structural value of the company's property, £9207 is the value of the buildings. They have been erected at different periods. The retort-house is of considerable age, and will soon have to be rebuilt. I have not had access to any accounts to see what the buildings originally cost. I made my own estimate from an examination of the buildings themselves. The company I believe keep a capital account, which professes to show what they cost for erection. I think I have seen some statement of the sort in their balance-sheet. The value of the retort-house, including the stage and chimney, I estimate at £3460. For the chimney, I take £150; and for the stage—that is, the cast-iron platform from which the retorts are charged—I take £510. I do not include in the £3460 the value of the retorts themselves, but simply the shell of the building. In distributing the rateable value, I give 1-14th to St. Botolph, because it is 1-14th of the structural value of the apparatus. There are no buildings in that parish; only mains, service-pipes, and meters. The receipts in the parish in 1857 were £3444. The coals carbonized at the Curtain Road station in that year were 14,657 tons, and their value in money £13,034. The gas registered by the station-meter per ton of coals carbonized was 9262 cubic feet, and the total quantity of gas made 135,756,000 feet. I made these extracts from the company's books for the purpose of this inquiry. Each ton of coal ought to produce a chaldron of coke, and generally does do so. I cannot tell whether, of the quantity of coke made, the company sell 62¾ per cent. All I can tell is, that, in 1857, they appear to have sold coke, tar, breeze, and other products, to the value of £4394. I should be very much surprised if it were 62¾ per cent.; I believe 45 per cent. is nearer the mark. It makes a very great deal of difference whether you are speaking of quantity or value. In quantity, the company might have sold 62¾ per cent. of the coke made. I have not worked it out, but, possibly, it may be so. The value of coke per chaldron varies very much. In 1857, I should think it was about 9s. That is a guess, of course; the company's books would be the best evidence on the point. I do not recollect whether it was dearer in 1857 than 1858. Coke is sometimes cheaper in summer than in winter, but not always. I cannot recollect whether it was in 1857. The price of coke varies in different localities. It may be very dear at a work in the east of London, and very cheap at the west end at the same period. In these works, having no means of storeage, they are obliged to dispose of their coke as fast as it is made. The return for breeze would not be 3d. per ton of coal carbonized. Breeze is a drug in the market, and is sometimes almost given away. I should say that these works are very badly situated for making gas economically; there is no convenience for carrying them on at a low rate of expenditure. Tar may be worth 6d. or 7d. per ton of coal carbonized; it makes about 10 gallons per ton, which is worth from ½ to ⅝ths of a penny per gallon. You may get any quantity you like for ⅝ths of a penny per gallon. The ammoniacal liquor is of very little value. A ton of coals will make 10 gallons of liquor, and a butt of 108 gallons is worth about 2s. 6d.; so that the return per ton of coal would be about 3d.; but it varies considerably. At the present moment, it is not worth as much as that. The price of sulphate of ammonia is exceedingly low. It has been worth £25; it is now worth only £13; and the manufacturers who use this liquor, will give very little for it. I have manufactured gas myself. I was lessee of some works at Taunton and Salisbury, in connexion with my father. They were small works. I know the price of gas at the other stations of this company. At Westminster, it is 4s. 6d. for common gas, and 6s. for cannel gas.

Mr. CLERK objected that his learned friend was cross-examining on a point which was quite irrelevant.

The RECORDER said he thought it was material, from the way in which the expenditure had been apportioned, to see what were the profits made by the company in their different districts.

Cross-examination continued: I do not recollect the exact proportion of the gas made at the Westminster station, which is sold at 6s. per 1000. In round numbers, it may be taken that one quarter is sold at 6s., and the other three quarters at 4s. 6d. There is none sold there at less than 4s. 6d., except for public lights. I think the question may be answered in another way. At Westminster, the gas rental was £1. 13s. 8d. per ton of coal carbonized; at Brick Lane, £1. 10s.; and at Curtain Road, £1. 8s. 9¾d.

By the RECORDER: At the Curtain Road station, there is a small quantity of gas sold out of the City at 4s. 6d. per 1000, but the bulk of it is sold at 4s.

Re-examined by Mr. CLERK: The Curtain Road station is very badly situated, there being no canal near it, so that all the coal has to be carted to, and all the products carted away from, it. A considerable amount of labour has to be expended upon the ammoniacal liquor before it is marketable. The amount put down in the accounts of the company is a net sum realized for that product. The same may be said of the other items—coke, tar, &c.; they are the sums received, less the cost of manipulating them. The practice is, for gas companies to contract for the removal of their ammoniacal liquor, but they are at the expense of putting it into the carts. The proportion of coke, at any particular gas-works, may vary considerably. I had a case recently, in a work of double this capacity, and much better situated for making cheap gas, where only one-half of the coke was sold. The quality of coke also varies very much; but the quantity, if the same coal is used, is generally much the same. Where there is facility for getting breeze away, it has a small value; but, as I said before, the reason why some of these items produce less here than at other works, is the small space the company have for storing products, which necessitates their selling them from day to day, as they manufacture.

The RECORDER asked whether the expenses were deducted from the £4394 for products, or whether that was a gross sum?

Mr. DENMAN said it was not an actual receipt but an estimate.

Mr. WATTS was recalled, and in answer to the recorder said, the gross receipts for products was £4910. 3s. 11d. at the Curtain Road station in 1857. From that sum were deducted the wages connected with them, leaving the net produce £4394.

Mr. *Bush* recalled, and examined by Mr. CLERK.

The total quantity of coals carbonized at all the stations of the company in 1857, was 109,667 tons. The quantity at the Curtain Road station was 14,587 tons. The total stores in value was £32,427, of which the stores at Curtain Road amounted to £4064. The proportion of discount due to Curtain Road on coals, would be £63. 1s. 9d., and on stores, £170. 19s. 4d., making a total of £234. 1s. 1d.

Mr. CLERK: There will, therefore, have to be added, £20 to Mr. Barlow's account of £2840, which will make the net rateable value £479 instead of £459.

Mr. *Barlow* recalled, and examined by Mr. CLERK.

I have here the receipts for gas per ton of coal at the several stations of the company. They are much higher at Westminster than Brick Lane or Curtain Road. They use a considerable quantity of cannel coal, at that station, and sell a portion of their gas at 6s. per 1000 feet. At Brick Lane, the rental per ton of coal carbonized was £1. 10s., and at Curtain Road, £1. 8s. 9¾d. If there was any excess of leakage at one time more

than at another, it would make a difference in the result. In 1857, the retort department of the Curtain Road station was in a bad state, and the company were wearing it out for the purpose of substituting another description of retort, and the retort-benches were old; in other respects, there was nothing peculiar. The leakage of this company is not extraordinarily great.

By Mr. DENMAN: The company at that time were getting all they could out of the retorts before pulling them down. That had nothing at all to do with leakage. There is not more leakage with cannel than with other gas; it ought to be less rather than more. Cannel gas is of greater density, and will not pass through the apertures with the same rapidity that gas of a lighter description does. The effect of adding the £20 just referred to, will be to raise the rateable value in St. Botolph to £34. 5s.

J. C. Daines, Esq., examined by Mr. CLERK.

I am surveyor to the Phœnix Fire Office, and have been so for twenty-six years. During that time, I have surveyed all sorts of buildings for the purpose of insurance. I have examined the Curtain Road station and works with a view to see what is their value for insurance. The average premium required would be at the rate of ½ per cent; some parts would be less—the dwelling-houses would be less. I value the buildings at £9849. I did not value the stock in trade and tools. The cost for reproduction of buildings alone would be 1½ per cent., or about £150 a year. I have also formed an estimate of the value of the freehold land at the Curtain Road station. I should say it is worth £6000.

Cross-examined by Mr. DENMAN: I believe that land is not in the respondent parish. I valued it by taking it at so many acres, and so many feet frontage. I did not value it for rating purposes, but at what I considered it was worth to sell. I am an architect and surveyor on my own account. In "buildings," I have included the walls of the retort-house: I estimated their value by cubing most of them, and putting them down at so much per foot cube. I also formed an estimate of the cost of erecting such buildings. I calculated that they might be erected for about £9849. I did not calculate the life of these buildings. I cubed them up at so much per foot, and some of the walls I measured, and put down at so much a rod. I should think the land has rather increased in value of late years. I do not know how long the works have been erected; I remember them myself for the last thirty years.

The RECORDER: I thought we heard that they were erected at the commencement of the company's operations, which was in 1812.

Mr. CLERK: A portion of them were erected then.

Re-examined by Mr. CLERK: Some of the buildings at the Curtain Road station are very old; but some of them are in very good condition. In arriving at my valuation of £9849, I put down the older parts of the buildings at a rather low price; some I put down at 4d. per foot cube, and some at 6d. In cubing them, I took into account their present condition. I had some of Mr. Barlow's figures, but only a few of them, at the time I made the valuation. I went and worked all these figures out myself; and, as regards the ground, I made a plan of it, and calculated the measurements. I have a sketch here of the ground.

By Mr. DENMAN: I did not take the acreage; I marked it out, and calculated so much a foot frontage.

Mr. *Barlow* recalled, and examined by Mr. CLERK.

I took the value of the buildings at £9207. Some of them are old. I took £5603 as the insurable portion of those buildings, that being what I consider the value of the parts liable to damage by fire; the rest is, for the most part, foundations, drains, and underground cisterns.

By the RECORDER: Mr. Daines does not include drains in his estimate.

Mr. CLERK: Mr. Barlow excludes them in calculating for insurance.

Mr. DENMAN (to Mr. Daines): Do you mean to say you should not include foundations?

Mr. *Daines:* I have included them, but not the drains.

Mr. CLERK: Valuing for insurance and valuing for reproduction are two different things. In taking your value, Mr. Barlow, did you look to the present state of the buildings?

Mr. *Barlow:* I took them in their present state, excluding all that is not destructible by fire. I did not take them at what they could be rebuilt for.

R. P. Spice, Esq., examined by Mr. CLERK.

I reside at Richmond, and have offices in Lombard Street. I am a contractor for the erection of gas-works, and have been for many years engaged in designing and enlarging gas-works. I am also lessee of three works, at the present time. I am, therefore, familiar with the construction of such works, and with all questions connected with the manufacture of gas. I have examined the station of the appellants in the Curtain Road. I have heard the evidence of Mr. Barlow, with regard to the rateable value of those works, and I concur in the estimate he has given, basing it upon the amended account given to-day, adding discounts and certain other deductions. In calculating what should be the amount of the tenant's capital, I have not taken it in proportion to the expenses; I think it preferable to take it in proportion to the gas rental. That proportion would vary to some extent, according to the price of gas; but, generally, I should take as a rule one-half the gas rental as the sum necessary to enable a tenant to carry on the works. The capital put down by Mr. Barlow is £12,000, and I should think that, for a tenant to be in comfortable circumstances, he would require that. He would be obliged to find money to purchase his stock of coals, his tools, and stores, &c., and a balance in hand, to meet current expenditure, until his receipts came in. I think, therefore, that this estimate is a very fair one. I have gone into a valuation of these works. The value of the insurable parts has been taken at £25,000, and I think it is an accepted rule that 10s. per cent. is the rate at which they are insurable. I think Mr. Barlow's calculation of the insurable portion is a fair one; it includes everything above ground that is liable to destruction. It would take more than that to build them new. The £25,000 represents the present value of that which ought to be insured. I have valued all the premises, for the purpose of reproduction and ultimate renewal, at an average of 1½ per cent. upon the sum of £45,000.

The RECORDER: Then you do not agree with Mr. Barlow upon that?

Witness: I forget what Mr. Barlow's figures are, but I take it that the renewal of the plant would require that sum to be laid by.

Examination continued: Some of the plant wears out much quicker than others. Probably, mains would have a longer life than other parts; they would last much longer than gasholders.

Cross-examined by Mr. DENMAN: I am lessee of the gas-works at Richmond, Wandsworth, and Putney, and at Watford. It is a matter of private arrangement what rent I pay at Richmond, and I do not feel called upon to state the precise terms upon which I hold those works. My landlords are the Richmond Gas Company; I lease the whole works. I have had them for a second period of seven years. I object to state publicly what rent I pay, as it may affect my interests.

The RECORDER: It cannot affect your interests, if you hold under a public company. As you come here to give evidence, you must tell us.

Witness: If your lordship so rules it, I will. I pay one-half of the gas rental.

By Mr. DENMAN: Last year, the gas rental was about £6000. I leave the company, in that case, to pay large expenses. I do not bear all the expenses; I simply pay that rent. The company pay nothing for me, but, on their own account, they pay certain expenses, as their portion of the contract. They pay rates and taxes, and a large number of expenses—all their own office charges in the town—the salary of the secretary and collector, the remuneration of the directors, and a variety of things. I have no idea what those expenses amount to. Probably, they may come to £1300 or £1400 a year, in round numbers. I have before me the last balance-sheet of the company, and that is somewhere about the sum. In my agreement with the Wandsworth and Putney Company, I pay 6½ per cent. upon their capital. The rent varies as the capital increases; last year it was £1500 or £1600, in round numbers. The gas rental there was £9000. I do the repairs, and pay everything. At Watford, I do the same as at Wandsworth. Last year, I paid them £480, and the gas rental was £1600.

The RECORDER: Have you to give up the works in as good a state as you found them?

Witness: Yes; allowing for fair wear and tear in all these cases.

By Mr. DENMAN: I cannot tell exactly the quantity of coals carbonized at Richmond—probably, it is about 2500 tons. I hold the Watford works for a term of fourteen or fifteen years, and the Richmond for seven years.

Re-examined by Mr. CLERK: At Richmond, the price of gas is 5s. 6d. per 1000; at Wandsworth, it averages about 5s.; and, at Watford, 6s. per 1000.

By the RECORDER: There is no competition at either of these places except Wandsworth. There the price of gas is 5s. 6d., less 6d. discount to large establishments for prompt payment.

By Mr. CLERK: If the price of gas at Richmond were reduced 1s. 6d. per 1000, and, at Watford, 1s., all my profits would be gone.

Mr. CLERK: That is my case.

MONDAY, MAY 20.

Mr. DENMAN said he believed that, in the present case, the great difference between the respondents and the appellants was on a matter of principle, as to the way in which the distribution was to take place, so as to show the rateable value of the property in the parish of St. Botolph. He would confine himself upon that point to the case of the West Middlesex Water-Works, which was strictly applicable to the present case. He knew it was said that there were a few inaccurate expressions used in the judgment in that case; still, it was a case perfectly easy of application, and it exactly applied in principle to the one now before the court. The principle was this:—The court would first ascertain the total gas rental of the whole of the works, the whole of the expenses, the value of the buildings, the value of the mains, the total rateable value of the whole, in order to ascertain the distributory value of the whole. Having done that, they would proceed to assign a value to the parts directly earning profits—viz., the buildings and works—and then assign a proper value to the mains and pipes. And this was a case in which the receipts in the parish were to be taken as the first mode of ascertaining the actual rateable value of the parish. The receipts in St. Botolph were about one-sixth of the total receipts. Having got the rateable value of the whole of the parishes, it was very easy to ascertain what was the rateable value in St. Botolph. There were one or two elements of difficulty, no doubt, which his learned friends on the other side had introduced—viz., that the works and buildings must be taken at their structural value. All this would be brought out in the further progress of the case. He would direct his attention to it, and he did not think the remainder of the case would occupy any length of time. It would be, principally, a case of cross-examination on the part of his learned friend, in order to test the validity of the evidence he should produce. Up to the last moment, he (Mr. Denman) had been labouring under the impression that the rate on the Westminster works was to guide the present case to a much larger extent than was now admitted on the other side. But, now it was stated that there was no such understanding on the other side as would enable this appeal to be settled by that one. He had, therefore, to take this case as a new one altogether; and, in doing so, he could not take the figures on the other side, although, no doubt, many of them were correct. But, taking these figures, and making some allowance for inaccuracies, he would call witnesses, who would enable the court to distinguish between the right and the wrong view. The figures on the other side had not grown "small by degrees, and beautifully less;" but they had grown so beautifully small, that they had absolutely come to nothing. He would, however, change the aspect of affairs, by calling witnesses who would place matters in a very different point of view.

Charles Penfold, Esq., examined by Mr. DENMAN.

I have had very large experience in valuing gas-works, for the purpose of rental and other purposes. I have made an estimate of the value of the Curtain Road station, which supplies St. Botolph. I began by taking the receipts for gas in 1857, £21,118; and I also took the number of tons of coal carbonized at 14,657. That is what the company returned. The sum of £4885 represents the residuals arising from the sale of coke. That is an estimate of my own, taking it at two-thirds for sale, which is the usual amount. I say that each ton of coal produces a chaldron of coke. The sum of £4885 represents the amount which the tenant would receive from the sale of coke, after using the usual allowance for fuel. There are breeze, gas liquor, and other products, £1450. There is 1s. 3d., per ton for tar, which makes £915. I proceed, then, to the expenditure, and say that the cost of coal is £13,034. From that, I deduct the residuals, and say that £5784 is the net cost of coals. I take the materials for purification from the company. I also take the workmen's wages from them. I have estimated the wear and tear of retorts at £770. They are charged at £1580. I find, by the company's own statement, that, in the year 1857, those retorts were renewed. I make out £770 in this way:—I find that, on the whole system, £6889 was expended upon retorts. I take 155 clay retorts renewed that year, at £10 each, which gives me £1550. Deducting that from £6889, it leaves a balance of £5339, as the current wear and tear of the retorts, over and above the renewals of them. That sum I have apportioned according to the tons carbonized over the whole system, compared with the coals carbonized in the Curtain Road district, and that gives £770. That is from the figures supplied by the company the other day. The lighting, cleansing, and repairing of lamps is the next item. I have taken the lamps at 13s. for the lighting and cleaning, not the repairing.

The RECORDER: How do you get at the 13s.?

Witness: From a Government return; it is an estimate.

Examination resumed: It is 10s. for lighting the lamps, and 3s. for cleaning. That is a fair charge. Salaries and commissions I next allow. There are certain expenses which they claim as deductions, such as stores used in carrying on the works, pavements, directors, and auditors, which I do not deduct: I provide for them afterwards. We are not to include them in getting at the rent. They are suitable allowances to be deducted from the rent when that is ascertained. For the salaries and commission, I allow £1216. The rates and taxes I allow are the same as the company allow; the

law expenses also are the same. Bad debts, I put down at £423; and these also I take from the company's return. I said that I do not allow these six items in the first instance, because these are afterwards allowed in the statutable allowances, as directed by the Assessment Act. That brings it to £14,129. Taking that from the gross rental of £21,480, leaves £7351. I then proceed to make the statutable reductions. First of all, in order to find the tenant's capital, I say that £14,129 would be the total of the owner's working expenses. I take 3 per cent. for repairs and renewals on £42,292, the structural value of the works, not including land. Then I have insurance on £5000 at 4s. 6d. per cent. That £5000 represents the value of the destructible or insurable apparatus. I would not insure retorts or tanks, because retorts are full of fire, and tanks are full of water. I do not allow insurance for things which are not in their nature destructible. I believe that buildings with brick or stone walls cannot be destroyed, nor can I see how a tank can be when underground. In my judgment, £5000 is the extent of the property which requires to be insured, and that can be done at the rate I have mentioned—4s. 6d. That brings the expenses up to £15,409, supposing the tenant had to pay that before he received any rents. They only take four months to collect the rents, but I take four and a half, for I do not think they would collect them in less. If I take four, it would be about one-third part less than I allow. There are other stores, £500, and moveable tools, £500. The total is £10,033, which, I think, is ample capital for the tenant to have. It is within £2000 of Mr. Barlow's estimate. Upon that I put 15 per cent. for the tenant's profits. I have there made all the deductions which I conceive ought to be made to arrive at the rent the tenant would give for the whole, and that is £5589. The rent of the land upon which the gasholder stands is £192. I have taken Mr. Penny's estimate for that. Upon the stations, buildings, and plant, I get £1342. That is 8 per cent.—5 per cent. for the tenant, and 3 for the repairs and renewals. That is 8 per cent. upon the cost. The net rent would be £810, the repairs and renewals, £532, and the rent of land, £192; making together, £1534. That leaves £3955 for main services, meters, and lamps. In the parish of St. Botolph, there is nothing but main services, meters, and lamps. I allow £737 for repairs and renewals upon the cost of them. I got that from Mr. Penny, the estimate being furnished and the figures being supplied by the company. That leaves £3218 as the rateable value as respects those mains, meters, services, and lamps, in and out of the parish. Having deducted the rent of the land, and the stations, buildings, and plant, there is nothing so fair as taking the receipts af St. Botolph, as compared with the receipts of the whole. Having taken the total receipts at £21,118, and having brought the rateable value to £3218 of the whole, then I take the receipts of the parish at £3446, which brings out £737 as the rateable value in this parish. That is what a tenant could afford to give under the Parochial Assessment Act.

Cross-examined by Mr. CLERK: I was not consulted before the rate was made. I did not make the rate, and had nothing to do with the case until within the last fortnight or three weeks. I took the number of tons of coal carbonized from the company's statement. In order to get at the £4885, as the amount that they ought to receive from coke, I assumed that they got 10s. per chaldron. The materials for purification, and the workmen's wages I took from their own accounts. The repair of the retorts was an estimate of my own. I never constructed a gas-work; I never managed one; I never manufactured a thousand feet of gas in my life. I never built a house in my life, and yet I know how to value one. I start with £6889 as the total expenditure of the retorts in 1857. I took that from the company's accounts. I thus ascertained that clay retorts were substituted for iron retorts in 1857.

Mr. DENMAN: If my learned friend means to repudiate the company's half-yearly accounts, all we can say is, that those accounts were published.

The RECORDER: If there is any error, the company can produce their books.

Cross-examination continued: I have heard it stated here that the clay retorts were not put up until after 1858. I have made a deduction for 155 clay retorts, at £10 each; and I did so, because in the GAS JOURNAL of the 11th of May, 1858, the deputy-governor is reported to have used the following words:—"The cost of retorts, in 1856, was 1s. 5½d., and in 1857, 1s. 9½d.; but that increase arose in consequence of having to replace the whole of the retorts at the Curtain Road station. The expenditure in the second half year of 1857 was just double what it was in the beginning of the year, and that shows that the money was laid out in that year in the construction of new retorts. I make the sum £770, instead of £1580, which the company charge.

Mr. DENMAN: The retorts for the first half year of 1857, they set down at £2354, and for the next half year, from June to December, 1857, they are charged at £4531.

Cross-examination continued: The quantity of coal carbonized was 14,657 tons. I have taken that quantity at so much per ton. If I take 14,657 at what the governor is reported to have said it was, 1s. 5½d., that would bring it to £1068. 15s.; but that would include the new retorts. I take lighting, cleansing, and repairing lamps at 13s. The amount actually expended by the company on that was less in 1857 than it was in 1856. The amount was £558. 12s. The rateable value would be the same whether the tenant or the landlord did the repairs. I get at the rent first, and then take off the statutable allowances. The amount expended that year in lighting, cleansing, and repairing lamps, was £558; £1615 would be the wear and tear of retorts. The tenant would have to expend for stores in carrying on the works, and he would have to pay wages for repairing and fixing meters. If the tenant of the gas-works supplied gas, he would not have, from time to time, to take up pavements to carry in new service-pipes; but I have nothing to do with new service-pipes in the present estimate. No doubt, that in the repairing of pipes and mains he would, from time to time, have to raise the pavement. The works generally of the station would have to undergo annual repair. When a tenant takes anything, be it a house or a manufactory, he considers what the probable amount would be what he would have to expend in carrying on his business. Universally, in every case of *bonâ fide* trade, since the Act of William IV. was passed, besides the annual amount allowed to the tenant, and allowed to him before he ascertains his rent, a further reduction from the rent is allowed, which is called a statutable deduction. The whole arrangement is a matter of statute. I put the rent of the whole, which the tenant would have to pay to the landlord, at £5489; but, in getting that, I have not made any deductions for what the tenant would have to pay for stores, or expenses for the pavement, or expenses for repairs in meters. The sums provided here, *valeat quantum*, under the head of stores, pavements, meters, and so forth, come to £3269. I allow £1269 for repairs and renewals. The repairs would be £532, and the renewals, £737. The company say they expended £570 in stores alone. I allow £532 for stores. I put £532 against £3269 actually expended. I have heard that Mr. Barlow estimated the apparatus at £25,600. That estimate included tanks underground. I never heard of a fire breaking out at any gas-works. The tar might overflow from the tarholder and gasholder, but I never heard of such a thing taking place. I never heard of lightning destroying a gasholder. I never heard of a fire at Dublin, where tanks full of water were destroyed; but I think, that if such a thing ever happened, the water must have been decomposed first. I take the insurance at 4s. 6d.; that is the dwelling-house risk. The fact is, gas companies never insure at all. The whole of my calculations are based upon this—that the year's working expenses are £14,921. I allow for a quarter of a year's coal being in store. The tenant must, of course, expend money on coals. In the winter, he would consume a great deal more coal than he would consume in the summer. The moveable tools is an arbitrary estimate of mine. I think £500 would cover them. My own idea guided me in the matter; I certainly did not go and count the barrows up. The money is expended entirely in coals, and wages, and stores, and moveable tools, and I assume that the tenant has that money to spend. He has the residuals coming in before he is called upon to pay his rent. I screw the tenant down to a capital of £10,000, while Mr. Barlow claims £12,000 for him. The rent of the land I put down at £192. I believe the land is three-quarters of an acre. It has a frontage, but that is of no value in connexion with gas-works. I did not value the land at all. Before I deduct the amount for repairs and renewals in respect of the mains and services in the parish of St. Botolph, I deduct the rent of the land in Curtain Road, and the value of the station and buildings, and then I deduct the special expenditure for the repairs and renewals in respect of the mains and services in the parish of St. Botolph, from what I estimate to be the rent of that proportion. It is an assumed tenancy. We are obliged to take the special receipts and special expenses. The courts have decided that.

Re-examined by Mr. DENMAN: With regard to the retorts, I have seen the printed accounts of the company, and observed that there was carried to capital certain expenditure on retorts and purifying-house. The next year they only expended £538 upon the retorts. Clay retorts cause a very much less expenditure than iron retorts. If there was only a difference of 3¾d. in changing iron into clay, the difference would be much less than I put it at, £570. The difference between 1s. 5½d. and 1s. 9½d. is added for the putting in of clay instead of iron retorts. That item would have been greater had iron been put in instead of clay. Clay retorts last a much longer time than iron, and cost less than iron for keeping up and maintaining. In the statutable deductions, I have made a fair allowance for repairs and renewals. I have valued nearly all the gas-works in London, and fourteen or fifteen in the country. The tenant would, of course, consider what rent he could pay, including the renewals and repairs. I believe a tenant would be ready to give a sum equal to the rateable value I have spoken of for the whole of these works. I would not estimate the works at the exaggerated sum which an insurance company might wish to demand. If they were insured at all, they might certainly be insured at the rate of 4s. 6d. If I assume that there is a tenant willing to take the property, I also assume that the person willing to take it can work it at a profit.

Mr. *Henry James Castle*, examined by Mr. CROOM.

I am a surveyor, having considerable experience on gas and water subjects. I have gone through the calculations of Mr. Penfold, and have heard him give his evidence. I agree with him in his calculations, and in the result.

Cross-examined by Mr. CLERK: I did not value the land at Curtain Road. It was not the office attributed to me. I did not take the structural value of the buildings.

Mr. *Alfred Penny*, examined by Mr. DENMAN.

I have had experience in gas-works, and have been a lessee of gas-works. I heard Mr. Penfold's evidence just now. I furnished to him what, in my opinion, would be a fair amount for the tenant's capital to carry on such works as these. I gave him an estimate of the structural value of the buildings. My estimate for the cost of land, buildings, and machinery, was £25,449. I then added the cost of mains, meters, and services. The figures I worked out with my own estimate. My estimate for mains, meters, services, and lamps, was £25,077, making a total of £50,526. That is the cost as new. I estimate the tenant's capital by my own experience. The largest sum I ever used at Portsea was £5000, and I estimated the capital of the tenant for carrying on these works would be £10,000. I believe that I could carry them on with that sum. Supposing the total gas rental of any concern of this kind to be £20,000, the fair rent the tenant could give for it would be £5194 per annum; but that would be subject to the landlord paying rates, and taxes, and insurance, and providing a depreciation or renewal fund. As to the rates and taxes, I am not able to give an opinion; but these would depend on the particular parish. For the renewal fund, I would put down 1½ per cent. upon the original cost of the works and mains. In my calculations, I have taken the price of gas at what I have heard it is in this case. I did not enter into the question of directors in my calculations. The rateable value of these works, taking the statutable deductions, would be £5194, subject to this, that I have not gone into the rates and taxes and depreciating which may amount to £1000 a year. I put the land at £3840.

Cross-examined by Mr. CLERK: I am a coal-merchant. My coal-wharf is at the Regent's Park basin. I have the Wenlock Iron-Works at the City Road, and there I manufacture gas machinery. I am not a surveyor. I estimated the value of the land in this case at £3840, and the station and plant, buildings and machinery, I put at £21,609. For a period of three years, I manufactured gas at Portsmouth. A portion of it fetched 5s. 6d. per 1000, a portion of it 5s., and the public lamps were 3s. 9d. I manufactured 70 million cubic feet per annum when I first went there. The stores and stock of coals were valued to me when I entered, and I paid £3000 for them. The gas rental there was to be divided between the gas company and myself. I am constantly valuing mains and meters, and know the cost of them. I have reconstructed gas-works at Uxbridge capable of making 25 million cubic feet per annum. They have been making 12 millions; but they were constructed by me to supply the whole town with gas. I have constructed works in the Isle of Man. I have constructed some dozen works altogether, but they were small works principally. The Isle of Man works were for 6 or 7 million feet annually.

Re-examined by Mr. DENMAN: The gas rental at Portsmouth was £25,000 when I left. It increased from £12,900 to £20,000 in the three years I was there. I paid half the gas receipts in rent. I have had constant experience in all these works. It is in the nature of gas-works to begin as small concerns, and gradually to grow. When at Portsmouth, I had the whole management of the works, and had to purchase the coals, and to perform all the functions of the gas company, except to collect the rent. The gas company collected the rent, and handed me over the half of it, and no payment was made to me until four months after the commencement of each quarter.

Mr. *George Anderson*, examined by Mr. CROOM.

I am a gas engineer, residing in London. I have built some of the largest and also some of the smallest gas-works, and have had a good deal of experience at them. My experience is of fifteen years standing. I am a lessee of gas-works myself. I know the district round Curtain Road, for it is a populous district, and coke would be very saleable there. I have examined Mr. Penny's estimate, and heard his evidence, and can support him in it

generally. His is a fair and ample estimate; and, I think, it would enable a tenant to give from £5000 to £6000.

Cross-examined by Mr. CLERK: I have seen these works, and my view of them has tended to lower my estimate of them considerably. I was over them before, some years ago—some five, six, or seven years ago; but not for the purpose of valuation. I saw them for the first time this morning for the purpose of valuation, and it lowered my estimate very much of what I would give for them. I manufacture at two of the places I lease for a certain price. At Dover, there is a fluctuating rent, according to the quantity of gas made. I receive a certain proportion of the gas rents, which is my profit. I pay the whole rental to the company, and they pay me back at the rate of 3s. 4d. per 1000 feet; but generally, everything goes into the bank. The company divide the dividend, and receive the money from us, or the bank. At Carrick-on-Suir, I pay a fixed rent to the company. Our manufacture at Dover is verging on 50 million cubic feet a year. I do not know what we are assessed at at Dover. I have a person there, a Mr. Jones, who acts as my partner, and he takes the general management. I cannot say whether the assessment at Dover is £400 a year or not. I do not know what we really do pay. I have nothing to do with the financial department; I leave that entirely to my partner.

Re-examined by Mr. DENMAN: I receive at Dover 3s. 4d. per 1000 on the gas manufactured, and the residue the company receive is about 1s. 8d. We do everything, and pay the 1s. 8d. by way of rent. The total amount of gas is about 50 millions a year. The total gas rental is somewhere about £10,000 or £12,000.

Mr. *Golden Davis*, examined by Mr. DENMAN.

I am the vestry-clerk at Shoreditch. The rateable value of the buildings and mains of the Chartered Gas Company, in 1857, was £1100. Their gross estimated rental was £1450. Since then, it has been raised. The property has been surveyed by a surveyor. The actual amount upon which the money has been paid is a gross estimated rental of £2475, rateable value, £1650. Since then, it has been reduced again, at the instance of the company. The rateable value was £1500 this year. That is the rateable value not only of the buildings and land, but the entry in our books runs thus:—"The Chartered Gas-works, lodges, offices, retort-houses, coal and coke-houses, tanks, sheds and workshops, mains, plant, and premises, together with land, with a conduit for pipes, and extending for a distance of three miles, 416 yards within the parish."

The RECORDER (to Mr. Penfold): There is an item of £1342 in your statement; what have you put the rent of the stations at?

Mr. *Penfold:* At £1534, of which £810 is for interest on the capital expended in erecting the works; £532 repairs and renewals; making together £1342; and £192 rent of land.

This was the respondents case.

Mr. *Musgrave* recalled, and examined by the RECORDER.

I am the storekeeper. There were no clay retorts used at the Curtain Road station in the year 1857. Had they been supplied, they must have been supplied through me.

Cross-examined by Mr. DENMAN: The first time the clay retorts were supplied to Curtain Road was, I think, about September 1858. Ever since 1858, they have been used there.

Mr. DENMAN addressed the court for the respondents: He said this was one of those cases in which the observation applied, that nothing was more fallacious or more absurd than mere conglomerations of figures, and mere estimates formed from conglomerations of figures, which were to lead the court to a practical result. Now, he thought that the whole history of this case was pretty well illustrated by the course taken on the part of the company themselves. Mr. Barlow had told the court very fairly, that this valuable property, which the court was to assume the company were about to part with, would be let to a tenant for £30, £40, or £50 a year; and it was upon this assumption that the court was now called upon to say that the rateable value of the property was £34 a year. But, the moment that case was made, it was obvious that there was a fallacy somewhere, and when the court had that fallacy established to its own conviction, then they would begin to see what to form a judgment upon. Now, in this case, they had evidence as to what the company really believed to be the value of their property, and upon that evidence he maintained that there was the most satisfactory testimony given to confirm that which he admitted was a mere theory, so far as Mr. Penfold was concerned. If the evidence on the other side rested upon it, perhaps it might be said that it was no better than the testimony given by Mr. Barlow, proceeding as it did from a gentleman who, however well qualified in all other respects, had an interest in the company, and was constantly advising them. But the last witness his learned friend called the other day was Mr. Spice; and, when his testimony was compared with that given to-day, it would be seen that he had given the fair rateable value of the property; and, his evidence confirmed that of Mr. Penny and Mr. Anderson. It might be said that the parish had only rated the property at first at £22. That was a matter not now in question, except so far as his learned friend might try to use it for the purpose of saddling the parish with the costs of the appeal. No doubt it was very difficult exactly to hit the true rateable value of any property in a given case; but, in any view of this case, except the most absurd and unreasonable view, this company had been hitherto most grievously and absurdly underrated as regarded the parishioners. Upon that point, the court had just been listening to the evidence of several persons of great experience. Mr. Penfold had estimated the rateable value at £737, in a manner wholly independent of any influence; so that the fact was, that £838 was, after all, not a very large sum, when the court compared it with the actual amount which was proved to be the rental of the company. In all cases of this kind, it was to be assumed that there was a tenant willing to carry on the business profitably, and to his own advantage; and here they had to find a tenant for a property which was actually bringing in £3447. With reference to the value of the property in the parish of St. Botolph, there were one or two tests here which did not exist in every case, but which were most important in this instance. Mr. Spice told the court that the trading capital of such a company was generally half the gas rental; and, when the court made a fair allowance, it would be found, unless, indeed, there was an extraordinary difference in the circumstances, that, tested as his works had been tested, the rateable value of this company's property came almost precisely to the same amount as the parish were now seeking to put upon it. Mr. Spice said that he was the lessee of the Richmond Gas Works, that he paid the company half the gas rental, that, as the gas rental was £6000, he paid them £3000, that the company paid for rates and taxes, secretary and collector, and that these expenses were something like £1300 or £1400. He (Mr. Denman) would take them at the higher figure, so that it left him a balance of £1600, which might be considered his rental for the premises. The larger gas-works were of course the more profitable. His learned friend had tried to distinguish the Richmond case from the present one by getting from Mr. Spice that the gas rental was 5s. 6d. in the one case, instead of 4s. in the other. But that would only make a difference in the same proportion as 11 was to 8. It was, of course, to be assumed, in all these cases, that there was a profit made; and it must be assumed that the expenses were a fair average in both cases. Mr. Spice could afford, with gas at 5s. 6d., to pay a rent of £1600; if he only got 4s., he would pay in the ratio of 11 to 8 less rent.

The RECORDER asked how this theory would stand, supposing the owner was receiving only 1s. instead of 4s. for his gas?

Mr. DENMAN replied, that he was assuming there would be a profit in proportion to the gas rental. Suppose he got 4s. instead of 5s. 6d., then the rent he would have to pay would be, as he had stated, 11 to 8, or, in other words, as 5s. 6d. was to 4s., so would £1600 be to £1236. The £1236 upon the smaller concern would be equal to £1600 upon the larger; and, arguing in that manner, it would give a rateable value in St. Botolph higher than £600.

The RECORDER thought the learned counsel was in error, and that the calculation must be made upon 3-11ths of the gross receipts. That deduction would come to £1635—an amount which would take away the whole of the tenant's profit. He would receive £1600 less money at the 4s., and, therefore, the man's profits would be *nil*.

Mr. DENMAN admitted that there must be a fallacy in his calculation. He would endeavour to put it in a more scientific way, and which, he believed, would be found to be quite correct. Mr. Spice said that he paid to the company half the gas rental, the charge per 1000 feet being 5s. 6d. Well, now, if 5s. 6d. were charged, and he paid half the rental, he paid his working expenses, and obtained his profits, out of 2s. 9d. per 1000 feet of the gas sold. But, out of the other 2s. 9d., the company had to pay for collection, rates and taxes, directors, renewals, &c. Let that principle be applied to this case. Here was a gas rental of £21,118. To obtain that, 4s. per 1000 feet was the price of gas. The total amount of gas sold, therefore, was 105,590 cubic feet. Now, if Mr. Spice, or some person like him, were taking the works at Curtain Road, he could afford to pay as rent to the landlord, 1s. 3d. per 1000; or, in other words, he would pay the difference between 4s. and 2s. 9d. Taking the total amount of the gas sold, and multiplying that by 1s. 3d., it would be found that the rent he would have to pay would be £6599, the company finding the proportion which Mr. Spice said they found in the particular case of Richmond, deducting the ratio of 14 to 30 from £6599.

The RECORDER said the point for consideration was, whether the expenses would be in proportion to the rental; and he reminded the learned counsel that, in his calculations, he was not taking the expenses in that proportion.

Mr. DENMAN said that, even assuming the other side were right in comparing so large a concern with so small a one, the sum of £3266 would still be left after all the deductions had been made. But the deductions at Curtain Road would be nothing like in the same ratio or proportion.

The RECORDER asked what would be deducted from the £6599?

Mr. DENMAN replied, the cost of collection, bad debts, rates and taxes, and renewals; and the total amount of these would be £1629, leaving a balance of £4970. Deducting £1500 from that, for the rent of the station, a balance would be left of £3470.

The RECORDER said there must be some mistake in these calculations. The bad debts were £423, and the cost of collection £600. This was £1000 at once, without any renewals.

Mr. DENMAN, after commenting upon the evidence adduced by the respondents, said it appeared to him there must be a great fallacy somewhere in the figures produced by the appellants witnesses. But, supposing no fallacy existed, there was nothing to bind the court arbitrarily to say that exactly so many thousands of pounds ought to be the tenant's capital in such a case; neither was there anything to bind the court arbitrarily to say that the proportion to be paid for insurance was to be so and so. All these things must be looked at with reference to the subject matter. Estimates of the kind produced here, relative to a concern on which a large per centage was paid, were not to lead to the absurdity which was attempted on the other side. On the contrary, the court had a public right to look at the whole case, with the eyes of common sense, and with such facts as had been supplied, and then to say what the rateable value of the property really ought to be. The court knew that the gas rental of the whole concern was £21,000. The recorder had heard from the witnesses what would be the fair proportion of that to give for rent; and he might know, of his own knowledge—and, if it did, he was perfectly competent for him to act upon that knowledge—that the sum of £5000, one-fourth of the gas rental, was was not an exaggerated sum in that respect. There were certain cases applicable to the present one. There was, for instance, the case of the West Middlesex Water-Works. In this particular case, the works and buildings had been rated at £1500; and that included three miles of mains, as well as the buildings, amounting altogether to £1500. This showed that there was only £1500 to be deducted in the parish of Shoreditch. What remained, therefore, for the rest of the parish for the actual assessment which was to be made with reference to the property of the company? The other side, he supposed, did not say that £1500 was the actual rental. If they did, then his learned friend would be flying in the face of the West Middlesex case. The estimate of the whole, as given on the part of the parish, was confirmed as against the company by the fact that they only paid £1500 in Shoreditch. Mr. Penfold had put £1534 as the rateable value of the buildings in that parish. Was it to be said, then, that on a gas rental of £21,118, the rateable value in St. Botolph was only £200? What had been said about St. Botolph would apply to every other parish in which gas was supplied. What had become of the rateable value of the whole of the property? Suppose there were four or five other parishes similarly situated to St. Botolph, and that they were each to be rated at only £30, what would follow? Why, a complete conflict with the West Middlesex case. How where the respondents to meet such a case as the present, except by saying that the estimates on the other side were wrong? And how could they prove them to be wrong, except by showing that they had estimated everything at too high a rate? The court must assume that there was a certain amount of profit made at these works. In fact, it must be assumed that the concern was a profitable one. It had not been proved what the total dividend of the company really was; but the court was obliged to assume that there was a willing tenant ready to carry on the works which the company were now conducting. Mr. Penny came forward, and said that he would give the amount. Mr. Anderson substantially told the court that he also would give the amount. And there was this remarkable fact connected with their promises—that they might be held to their bargain any day. They were persons who were best able to form a judgment about the matter; and not persons who would give figures and estimates of their own, and erroneous tests.

The RECORDER reminded the learned counsel that Mr. Anderson would require 3s. 4d. per 1000 feet, in order to remunerate him for his capital.

Mr. DENMAN said that Mr. Anderson paid everything. Supposing the company were to take 8d. upon the gas rental, the return for the district would come to £4000.

The RECORDER said, that that would amount to nearly one-sixth of the £21,000.

Mr. DENMAN observed, that £3446 would be about the proportion of the £21,000. The 8d. would, in fact, come to £3530.

The RECORDER stated, that that proportion would not take in the renewals.

Mr. DENMAN referred to the judgment in the West Middlesex case, and contended that that judgment entirely supported the view of the parish of St. Botolph in the present case. In the settlement of this question, the recent case of the *Queen v. the North Staffordshire Railway Company* might be rendered available, that being a case in which a great deal of discussion had arisen as to the principle of assessing, It was there contended that the surveyors had laid down an arbitrary sum for the capital. His (Mr. Denman's) own witnesses had, perhaps, fallen into a similar error; indeed, he admitted that they had; but it was not because witnesses might put down an arbitrary sum that the court was at once to rule in their favour. The court must take a fair and reasonable view of the whole matter, and assess at the actual value at the time, and not at an exaggerated value upon some imaginary state of things which might have existed some years ago. Let the court take a broad view of the matter, and say that, however Mr. Barlow might have persuaded himself to the contrary, a company, which was making £21,000 of rental, ought to be assessed at a rateable valuable upon the whole of something like one-fifth of that amount. At all events, the court would say that, in the parish of St. Botolph, where the company were actually making £3300 of gas rental, they could afford to pay at least upon £500. Although surveyors might have given strong opinions on the other side, he apprehended that, with all the facts and figures supplied by Mr. Penfold, Mr. Penny, and Mr. Anderson, the court would have no difficulty in saying that the rateable value in St. Botolph was £500, which was the amount for which the parish was now contending.

Mr. CLERK, in addressing the court on the part of the appellants, said he would commence by dealing with the principle which his learned friend held to be fallacious in connexion with the series of figures that had been brought forward: certainly, they might be made very fallacious. If, for instance, the court were to take a little bit out of one set of figures, and then a little bit out of another, they might be made exceedingly fallacious. He would first deal with the case which his learned friend said was the rateable value, and then he would show what the rateable value really was. His friend had appealed to the court strongly upon the suject of the rateable value, and had asked the Recorder to take a broad view of the case, and not to be guided by figures, or by the accounts, because it was to be presumed that these figures and accounts were fallacious, and that they ought not to be taken as a guide in ascertaining the rateable value of the parish of St. Botolph. But, when the court had decided that the balance-sheets of the company were to be taken, and that therefrom the gross profits were to be deduced and eliminated, what was the object? Why, the object of that was for the very purpose of getting rid of all these speculations, and of putting an end to the large views of which his learned friend had been speaking. True it was that some of the witnesses had said they would give £5000 for the property, regardless of what the actual profits might have been; and equally true was it that his learned friend said there had been the large sum of £3400 received from the sale of gas in the parish, and that, therefore, in his opinion, the works ought to be rated at a higher amount than the company were contending for. But, it seemed to have been forgotten that some of the gas in this case was manufactured at another place, and that the tenant would have to take into consideration some of the items connected with its production there. The tenant would know that, if he had a profit in the one case, he would have a great loss in the other, and that the manufactured article upon which a profit was derived in the parish of St. Botolph, was subjected to a considerable outlay. But, what they were rating here was the land occupied by the main and service-pipes which were situated in the parish of St. Botolph. Passing over much of what his learned friend had advanced, and which really had no bearing on the main issue, he would come at once to the rating. His learned friend said that he was glad to lay hold of something tangible in the evidence adduced on the part of the company, and, accordingly, he adverted very particularly to Mr. Spice's testimony. Now, it appeared from Mr. Spice's evidence, that, out of a rental of £6000, in the parish of Richmond, he was paying a sum of £3000. The company paid £1400 for him in rates and taxes, and other expenses; but, to that must be added the cost of renewals, and the reproduction of which Mr. Spice took no notice. They received that sum of £3000, Mr. Spice selling the gas at 5s. 6d. If the gas were sold at 4s., then there would have to be deducted from the £3000 a sum of £1635. And here it was to be recollected that the works, in the one case, were three and a half times the size of the works in the other. From the £1365, which was the sum the tenant could afford to pay over, there would be a sum of £1400 to be paid by the company; and these two sums together showed the whole fallacy of comparing the rateable value of the property in St. Botolph with the rateable value of that held by Mr. Spice, in Richmond. In point of general expenses, they would be nearly similar. Coal would be nearly as dear in Richmond as it was in London. Wages would be about the same. But, then, if the tenant got more in his receipts, in the one case, he would have the more to pay. If, indeed, he sold at the rate of 5s. 6d. at Curtain Road, he might realize a large profit; but, as he had to sell there at 4s., there was nothing absurd in contending that his profits must necessarily be less. Now, his learned friend, when speaking of the £1400 paid by the company for Mr. Spice at Richmond, seemed to pass very lightly over the deductions. But, what were these deductions? There were the bad debts, £423; rates and taxes, £574; salaries, and commission upon the collections, £1216; and, besides all this, there were the law expenses. The whole of the clerks salaries must also be included. Then, there were the expenses of directors and auditors, which must also be included, because, if the tenant did not employ auditors, he would require additional clerks. So that the whole of these sums, instead of amounting to what his learned friend had said, would come to £2849. If they wished to contrast what took place at Richmond with what took place in the parish of St. Botolph, they must do so fairly; and, inasmuch as the rental of Curtain Road works was three and a half times what it was at Richmond, they had to assume that the company would have to pay for Mr. Spice three and a half times the £1400 they paid at Richmond—a sum that would amount to £4900. His learned friend was anxious to introduce a comparison between Mr. Spice's works at Richmond and the works of the appellants, and what he (Mr. Clerk) was contending for was this, that if the works at St. Botolph were conducted upon the same principle as those at Richmond, the rateable value would be brought down to nothing whatever. Because, taking the gas rental at £6599, what would be the expenditure, allowing it to be made in the same proportion as at Richmond? From that sum there would have to be deducted three and a half times the expenditure at Richmond—namely, £4900. He was now comparing St. Botolph with Richmond on the terms mentioned by Mr. Spice; and that gave the gross rateable value of the whole at £1600; but, from that a deduction was to be made for renewals. But, supposing he took £1600 as the net rateable value, his learned friend had contended that £1500 was the value in Shoreditch; and, admitting that that was right, and deducting the one sum from the other, there would remain a balance of £100. If, then, the Richmond case were to be argued upon at all, it must be argued as a whole, and the same deductions made at Richmond must be made at St. Botolph, only that they must be three and a half times larger in the latter case than in the former. The salary of the secretary would have to be added to that of the servants and officers. Making, then, a set-off for the cost of renewal, and taking the whole of Mr. Spice's deductions, the rateable valuable would be brought down to the one-sixth of £700, which would come to something less than the £22 which the parish had been receiving hitherto. All these calculations were, however, erroneous, and therefore it was most desirable to look at the figures as they appeared in the books of the company. The question was, in what respect could the accounts which they had produced be proved to be fallacious? or how had the evidence of that day shaken or disturbed the evidence previously adduced?

Mr. DENMAN expressed his belief that he was in error in the calculations he had made, and said there was one or two points upon which he was very desirous of putting himself right before the court. Mr. Spice had made out that the gas rental at Richmond was £6000, and he had made that out by the gas rental in the principal district being at the rate of 5s. 6d. In order to work that out, the court would have to work it by 8-11ths, and 8-11ths of £6000 was £4363. The comparison then was this—if the gas rental at Richmond were taken at 4s., it would yield £4363, instead of £6000. If that were so, then, of course, the half of that would be £2181; and he alleged that Mr. Spice could still afford at that rate to pay the half of that gas rental.

The RECORDER asked why? Surely, the main expenses would be just the same, though his rental would be so much less.

Mr. DENMAN quite agreed with the court in that respect. But the £4363 would be received, and he would pay out of that £2181.

The RECORDER said the learned counsel must be labouring under some mistake. Mr. Spice's expenses would be just the same in the case now supposed, and he would be still obliged to pay his rent, no matter what the receipts of his gross rental might be.

Mr. DENMAN still contended that even with a gas rental of 4s., instead of 5s. 6d., he would still be able to pay a rent of £600 or £700.

The RECORDER said that out of £3000 he would have to make his profit, and pay his expenses.

Mr. CLERK observed that if he could afford to manufacture the necessary quantity of gas for the sum of £3000, and make a profit thereon, that would leave £1365, which he would have to hand over to the company, who would then pay the rates and taxes amounting to £1400, which would leave them in a deficiency of something like £40 a year. This showed the fallacy of all his learned friend's calculations. It appeared, from the evidence of Mr. Penny and Mr. Anderson, that they had been selling their gas at 5s., or 5s. 6d. No doubt if a man sold his gas at 4s., he would pay just as much for his coal as if he sold it at 5s., and, therefore, the whole question of profit to the tenant turned upon the price at which he could sell his gas. If he sold at 4s., the profit would come out of what was received from the residuals. Now, with reference to the receipts, he should like to know in what respect they were fallacious. His learned friend had assumed that the company were in the receipt of £21,118. The entries upon that subject had not been made with any view to rating. They were simply made for the satisfaction of the company. His learned friend had contended that they were receiving some enormous amount for their products, and Mr. Penfold was of opinion that they ought to have sold 9971 chaldrons of coke at 10s. According to the books, instead of the coke producing £4488, the whole of what the company had received on that account, including tar, breeze, and ammoniacal liquor, was £4391. Moreover, they had not sold their coke at 10s., or anything like it. They were obliged to sell it as soon as it was made, and they only received 7s. 6d. per chaldron for it. This was a matter capable of the most distinct and satisfactory proof. Now, what was it that his learned friend disputed? According to the evidence given on behalf of the parish, nothing had been heard upon that point, except that the materials for purification had been deducted at the wrong time in the account, and also that the workmen's wages had been deducted at the wrong time; and then Mr. Penfold thought that the wear and tear of the retorts should be altered from £1550 to £770. Assuming that there had been 155 clay retorts put in in the year 1857, at £10 each, Mr. Penfold, by a process of his own, brought out a deduction of £770. But, according to the annual returns, it appeared that no clay retorts had been used in 1857, and that none were put in until 1858. It was a well-known fact, that when a company was changing from a system of iron retorts to clay retorts, there was a period during which their receipts would diminish. It was now abundantly clear that it was not in 1857 that change took place. At the Westminster station, a new retort-house was built in 1857; at Curtain Road, nothing of the kind took place; but there had been an absolute expenditure for iron retorts of the sum of £2000. These iron retorts only lasted about twelve months, and it was incumbent upon the tenant to restore them. This, then, instead of being an exorbitant sum, was a very moderate one. The company said they would not charge the tenant with that, that they would take an average of seven years; and it was found that an average of seven years would produce a sum of £1580. What right had Mr. Penfold to reduce the value of the retorts, according to some false data of his own, from £1550 to £770?

The RECORDER said that very probably about the time the rate was made, it had been ascertained that clay retorts were very much more economical than iron ones; and, therefore, the tenant would have to pay less in the one case than in the other.

Mr. CLERK said the tenant would have to take down the whole of the beds, in order to reconstruct them anew. An iron retort was replaced by simply loosening the brick-work; but, when a clay retort was sustituted for an iron one, you had to take down the whole of the bed.

Mr. DENMAN said he had been given to understand that this was quite a mistake.

Mr. *Barlow* was accordingly recalled; and, in reply to questions from the Recorder, said that you could place iron retorts with iron without demolishing the bed; but that, if you substituted clay retorts for iron, the arches had generally to be entirely rebuilt.

Mr. *Penny* stated that Mr. Barlow was in error. If the arch which supported the iron retorts were large enough, it would stand for the clay; but, if it were not large enough, then, of course, the company would be obliged to pull it down, and to make it large enough for the clay to rest upon.

Mr. CLERK said that, at all events, the change from the iron to the clay did not take place until the year 1858. He took it as a fact that nothing had been done with the view of substituting the clay for the iron until 1858, and that the average of £1580 must be considered exceedingly light. Then, the expense of the lamps was £585. What had Mr. Penfold said? He (Mr.

Penfold) had hit upon an ingenious device for cutting down the balance-sheet of companies, so as to bring up a much higher rateable value than appeared from the accounts. He said that some sums might be expended with which the tenant would have nothing to do. He alleged that he could not take these into account in a case of this kind; nor would he include in his first items, what was expended on stores, or the repairing of works and mains, or wages. He would include none of these things; but he would assume that from the rent he calculated, without making any of these deductions, a certain sum would have to be deducted for renewals, and he would take an arbitrary per centage, and then, according to his account, that would be quite a sufficient per centage to pay for the actual repairs. Instead of allowing a sum of £2383, Mr. Penfold would only allow for the renewals and repairs, £1269. To show what the annual repairs really were, the company had produced their books, and his learned friend had gone very minutely into them. The company had shown that a new main had been substituted for an old one, and that the excess had been carried to capital. That was not an expense which would fall upon the tenant during the year, but it was an expense which would have, nevertheless, to be deducted, in some shape, from the rental. The salaries and commissions were not disputed, neither were the general allowances, and expenses, and bad debts. There only remained the item for directors and auditors. He fancied that this was an item which was no longer, in the present day, a subject for discussion. If any imaginary tenant stepped in to take possession, he would certainly have occasion for the services of directors and auditors. At all events, he would require to have somebody to do the duty for him which was here done for the very moderate sum of £283. In every other case, this was an item which was at once allowed. Besides that, the tenant would require to have salaried servants.

The Recorder said that, in a great many companies, the object of the directors was to get business.

Mr. Clerk observed that, no doubt, this was so, and that, in a case like the present, where there was such a keen competition between the gas companies in London, it was the more necessary that there should be directors and auditors. Taking, then, the allowance to them at £283, that would leave a gross profit of £2451. That had to be increased by the discounts, £234. 3s. 6d., to which was to be added £160, the excess upon the new main. There was, then, a gross profit in trade of £2860. What, then, were the deductions to be made? It was clear that the hypothetical tenant who had been spoken of, when he came into occupation, must take results as he found them. A good deal had been said about the evidence of Mr. Penny, who, some time ago, had taken works at Portsea, where he made 70 million feet of gas, and paid a sum of £3000. But the manufacture at Curtain Road was double that amount, or nearly so; it was 135,756,000 feet. Here, then, the tenant would have to pay more. He would have to pay £6000 for the coals and stores, and moveable tools in proportion, for coming into works of such magnitude. His capital, too, would have to be proportioned to the maximum quantity of the coals and stores he would have to buy, particularly in the winter season. Mr. Penny had purchased at £3000, and he had estimated the capital necessary here at £10,000; whereas, Mr. Barlow had estimated it at £12,000. But he forgot to take into account that emergencies might arise, that an accident might happen, and that it would be impossible for a man to carry on the works if all his capital were expended. Mr. Barlow had, therefore, taken it at a very low estimate when he said £12,000; and he (Mr. Clerk) felt that he was fully justified in asking the court to take it at that amount. It had been ascertained that 12½, and sometimes 15 per cent., was the tenant's profit; but he was only taking 10 per cent. as that profit. The question of insurance came next. Mr. Penfold was of opinion that all that was required to be insured was £5000 at 4s. 6d.; but the value of the buildings alone was £9448, and they could not be insured for less than 10s. 6d., without the duty. Then, Mr. Penfold had not witnessed the overflowing of the tar, nor did he believe that the tanks could burst, and be destroyed. Yet, if either of these accidents happened, the company must, of course, be sadly inconvenienced, and subjected to considerable loss. Mr. Barlow had estimated the insurable part reasonably enough at £25,000, which, at ½ per cent., would come to £125. The case, then, stood thus:—The gross profit was £2860; deducting from that £1800, as the tenant's profit on capital, would leave £1060. Deducting £125 for insurance, would leave £935. From that was to be deducted £456, for reproduction, being at the rate of 1 per cent. on £45,600, the estimated value by Mr. Barlow, and that left £479 as the net rateable value of the property. Then came the question of distribution. The land was to be rated separately at Curtain Road. Now, the land had been valued by Mr. Dance, a professional valuer, at £6000. Mr. Penfold had been seized with a fit of unaccountable modesty, when he came to look at the land. Mr. Castles, also, though not seized with the modest fit, did not estimate the value of the land. Both these gentlemen were professional surveyors, but, although they went very narrowly into the manufacturing accounts, they omitted to do that which came more immediately within their special occupation, and they did so, according to their own account, because they were assisted on the occasion by Mr. Penny. Mr. Penny was a coal-merchant, having an iron establishment at the Regent's canal, and yet the two professional valuers abstained from making any valuation, and left it all to Mr. Penny, the coal-merchant, who valued the land at £3840, instead of £6000, which was the valuation by the other professional man. He (Mr. Clerk) did not care how this was distributed, because, if 5 per cent. were taken on the £6000, it would come to £300, and that taken from the £479 would only leave £179 to be distributed. But the contractor was entitled, according to the Hampton case, to 5 per cent. upon the capital expended on the station, and the capital so expended was £21,600. But, as this case was inapplicable to other cases, the company had thought it better to divide upon the principle laid down in the Cambridge case, according to the structural value. Unfortunately, the case which his learned friend had read to the court did not apply. The rateable value of the property at Shoreditch was said to be £1500, but that would be a matter of alteration before long. If the actual value of the land and of the buildings at the Curtain Road station were deducted, it would only leave £100 or £200 to be distributed. But what was it that was really rateable? It was the occupation of the land—the land occupied in the parish. Why was it valuable? Simply because there was a transit of gas through it. It was perfectly immaterial in such a case where the gas was sold: the question was, what was the rateable value of the land through which the pipes conveyed the transit? The company in this way made out a rateable value of £34 on the parish, and that being so, a rental of £22 was not so absurd as his learned friend had endeavoured to make out. There were some other expenses to be struck off as connected with the company; and, therefore, under no circumstances could the rateable value be raised to £60. He believed the course the company had pursued was a fair and reasonable one, and that to assess the property at the amount sought for on the other side would be to charge the company most arbitrarily.

Saturday, July 6.

The Recorder, in giving judgment this day, said: I was sorry to see the great expense which has been incurred in this case, because I am afraid that my judgment will only decide this particular rate. I was in hope, at the first, that it would have decided all future rates, but I am afraid it will not. It appears to me, that the amount of the gross profits of the company are £3224, which is somewhat beyond the amount which they were put at by the company. It would, perhaps, be convenient, as a guide in future cases, that I should say what items of expenditure I have disallowed. I do not allow the item for directors and auditors, nor do I allow the whole of the expenses of the establishment. For instance, there is the dividend clerk, which I do not allow, and a certain part of the secretary's salary, making these several deductions, leaves the gross profit of the company £3224. From that sum we have to deduct, first of all, the interest on capital and tenant's profits, which I take at 15 per cent. upon a capital of £10,000, and that gives the sum of £1500. Then, there are further sums to be deducted for insurance and reproduction, amounting to £556, or a total of £2056. Deducting this £2056 from the £3224, it leaves the net sum of £1168 as the rateable value of the company's station; and this I have divided by fourteen, there being one-fourteenth of the length of mains in the respondent parish, which gives the net rateable value there £83. 9s. Considering that, in this case, the rate was assessed upon a sum of between £800 and £900, which seems to me so far beyond what it ought to be, I am bound to allow the company the costs of the appeal.

Mr. Croom, who appeared for the respondents, asked for a case to the Queen's Bench upon one part of the judgment. His lordship had taken the length of mains in the parish in apportioning the rate instead of, as he submitted it should have been, the structural value.

The Recorder: That is what is done in the Cambridge case, and is sanctioned by the Court of Queen's Bench.

Mr. Croom said he understood that in opening the case, his learned friend relied upon structural value.

The Recorder: No; the West Middlesex Water-Works case was referred to, but no other.

Mr. Clerk said, according to that case, the court was to allow a per centage upon structural value to remunerate a contractor for establishing gas-works in a place, and a per centage upon all unprofitable mains. If his lordship had adopted that course, the assessment here would have been much less than £83.

The Recorder: This seems a much more simple mode of doing it.

Mr. Croom said his friend, Mr. Clerk, appeared to be the only person who understood the West Middlesex case.

Mr. Clerk, after consultation with the other side, said they had agreed that the amount of the appellants costs should be £125, and he asked the court to include that sum in the order. He had no doubt, though this was somewhat an exceptional case, it would guide all future rates.

The rate-book was then amended accordingly.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Marylebone Vestry, June 29.

Dr. Bachhoffner moved "That the salary for the joint offices of chemical examiner of gas and analyst, under the Act to prevent the Adulteration of Food, be fixed at £100 per annum." He reminded the vestry that Dr. Thomson had already been appointed chemical examiner of gas and analyst, but that no salary had yet been apportioned to those offices. He was sure that a more efficient officer could not be found; and they could not do better than follow the example which had been set them in a neighbouring parish, where the office had recently been conferred upon the medical officer of health.

Mr. Charles Carr seconded the motion, believing it to be the very lowest sum that could be offered for the talent which they required. In the City of London, the salary, for far lighter duties, was £150 per annum.

Mr. Wingfield opposed the motion on the ground that it was not desirable to allow any increase upon Dr. Thomson's present salary of £400. He remembered when that enormous salary was granted, and opposed by himself at a time when there were members of the vestry who would have voted £4000, if it had been proposed. He should object to there being any addition to the salary of the medical officer for performing the duties of these offices. If Dr. Thomson did not feel inclined to undertake them with his present huge salary, let him resign, and the parish would get another man for half the money, who would do their work as well, or perhaps better. (Oh, oh!)

Mr. Grange indignantly protested against the observations of the last speaker. He was astonished at the estimate put by Mr. Wingfield upon the value of the education and science which they required from their medical officer. He thought that men who had worked for their own living ought to have shown more common sense; they ought to know by this time that, even if they wanted a good working horse, they must pay a fair price for him. ("Hear, hear," and laughter.)

Mr. Sanders opposed the motion. He considered that there was no use in having a health officer at all, and now they were going to create another useless office or two. They would not be so liberal with their £400 a year if they had to pay it out of their own pockets. (Oh, oh!)

Mr. D'Iffanger, jun., had always opposed useless expenditure or extravagant outlay, but he could not class this proposed salary under either head; in fact, the extra labour thrown upon Dr. Thomson's hands would necessitate his employing assistance, which would absorb the whole of the amount named. The vestry had resolved that these offices should be established in the parish, and they could not refuse to pay for them. It was true economy to see that their gas was pure and their food wholesome, even if they paid much more than £100 a year for it. They had been agitating for years to obtain such an officer; and, if they employed a stranger of the requisite acquirements, they would have to pay a far larger sum.

Mr. Michell differed from Mr. Sanders as to the health officer being useless; on the contrary, he thought that nothing could be of greater importance than the health of the community. He must say he could not see anything extravagant or reckless in the proposed outlay of an additional £100 a year. (Hear, hear.)

Mr. Hodges said no one had ventured to assert that £100 a year was too much to pay for the services of a gentleman to fill these two offices. That was not, however, exactly the whole question. They must recollect that Dr. Thomson was paid a good salary as health-officer, and that he had two

assistants allowed him, because it was believed that the duties of his office were more than he could do single-handed. Now that he had the additional work of the new offices put upon him, it was evident that he could not devote so much time to the duties of his original post. They should, therefore, reduce his salary as medical officer of health, or else appoint another individual, who should hold the newly-created offices at a suitable salary. If £100 a year was not enough, he would not object to £150, or whatever was proved to be a fair remuneration. But, before they invested one officer with a salary of £500 a year, it behoved them to consider the ratepayers, and whether Dr. Thomson's salary as health-officer should not be reduced in consequence of his being able to devote less time to the duty. He would suggest, as an amendment, "That, considering the offices of chemical examiner of gas and analyst will necessarily occupy much of the time of the medical officer of health, it is expedient that the salary of the latter office be for the future £300 per annum." In the neighbouring parish of St. Pancras, it had been thought advisable to appoint their health-officer as gas examiner and analyst, at a salary of £80 per annum; but they had reduced his salary as health-officer in proportion.

Mr. FREETH rose to order.

The CHAIRMAN wished to know whether Mr. Freeth was calling him to order?

After some discussion, Mr. Freeth gave way to

Mr. BOTTING, who said this was a most important matter, and, in his opinion, should be referred to a committee to consider the duties of medical officer, and whether it was possible for one gentleman to fill the office of analyst and examiner in addition. He moved a resolution accordingly.

Dr. BACHHOFFNER said that this recommendation had emanated from a committee.

Mr. HALLAM seconded the motion. He thought that suggestions would be made in committee which would be highly valuable. He added, that Dr. Bachhoffner had stated in committee that Dr. Thomson would be happy to perform the duties of gas-examiner and analyst without salary being named.

Mr. FREETH supported the amendment. He considered Dr. Thomson was already overpaid. Besides, it was well known that large fees—£20, £50, or even £100—were obtained by analysts for their "slap-up" certificates of the articles sent to them by puffing tradesmen. (Oh, oh!)

Mr. NEATE said that, if Dr. Thomson were to take large fees for giving flattering or false certificates, he would be liable to be proceeded against for misdemeanour. Mr. Freeth had, perhaps, adopted such practices himself when connected with trade, but that did not give him the right to cast imputations upon others.

Mr. HUTCHONS observed that the £100 a year would merely cover Dr. Thomson's additional expenses.

Mr. YARDLEY said that the statements of Mr. Freeth must be emphatically denied; and he hoped, before they went to the vote, it would be distinctly understood that no officer of that vestry should receive any fee beyond his salary.

Dr. BACHHOFFNER had heard with indignation the insulting observations that had been made upon this subject. He himself had given many certificates, but he declared they always expressed his conscientious opinion after careful analysis. To say that men of scientific attainments and high professional standing were bribed by large *douceurs* to give favourable certificates, was an infamous libel. It was even something more than that; and not only so, but the ignorance of the speaker was displayed in making such assertions. No chemist whose name was worth anything would stoop to such practices. You might buy some men, doubtless; but, when bought, they would be found to be dear at any price. With respect to what had been said about fees of £100, the statement was simply absurd. Putting the question before them in a practical manner, he could assure them that to make the most simple analysis, even of bread, required great care and much expenditure of time. Calculating the salary proposed to be given to Dr. Thomson for these duties at so much per hour for the time he would have to devote to them, it would be found that the fee would be about equal to what a labourer would receive for carrying a hod of bricks up a ladder—(cheers and laughter)—and this is what they offered to a medical man who had gone through a laborious and expensive study. The whole of the amount proposed would have to be expended by Dr. Thomson in salaries; and, if they took off £100 a year from his salary as medical officer of health, it would be simply taking so much out of his pocket. (Hear, hear.)

Mr. BOTTING's motion was then put and carried.

ST. OLAVE'S DISTRICT BOARD OF WORKS, JULY 2.

Dr. J. NORTHCOTE VINEN, the chemical referee, submitted the following special report relative to the presence of ammonia in the gas supplied by the Surrey Consumers Company:—

I have to report that, in accordance with the arrangement made by your board, I met, on Tuesday last, at the board-room, a deputation from the Surrey Consumers Gas Company, accompanied by the engineer, secretary, and chemical examiner, on the subject of my reports respecting the presence of ammonia in the gas. I proceeded to test the gas in the manner directed by the Act of Parliament, and clearly demonstrated the existence of ammonia. An objection was raised by Mr. Warington, the chemical examiner to the company, that I ought not to use the test moistened, but dry. On doing so, the presence of ammonia was still evident, although in a less degree. I maintained that I was perfectly correct in using the test moistened, about which I had no doubt whatever; but, in order to strengthen my opinion, I wrote to Dr. Dundas Thomson, Dr. Letheby, and to Professor Brande, three of the very first authorities on this subject, and have received from each of them the most decided opinion in favour of my mode of testing. These opinions I should be glad to have an opportunity of submitting to your board to-day. I have further to report that yesterday I met Mr. Warington at the gas-works, Rotherhithe, and tested the gas before passing through the process for the removal of ammonia. It was then present in considerable quantity. On testing the gas after passing through the process, no trace of ammonia could be detected. We then went to the testing-room provided by the company in the Deptford Road, where, on applying the usual test, the presence of ammonia was as evident and distinct as at any of the examinations I have periodically made at the testing-room provided by your board. From these examinations, it appears that, when the purified gas passes into the main at the works in Rotherhithe, it is then free from ammonia, but that it is found in its passage through the pipes; and it is to be found in the gas burned in the houses of the consumers. Also, that the test used by Mr. Warington is not very sensitive, and is used by him dry, while I always used it moistened; and this is the cause of the difference in our reports. But, having the highest authorities for using the test in the way I have always used it, one of whom was the author of the clause of the Act directing its use, I shall still continue operating in the manner I have hitherto done.

The letters alluded to were as follow:—

41, *Finsbury Square, June* 27, 1861.

Dear Sir,—Whoever disputes your practice of moistening the turmeric paper before it is held in gas for the purpose of testing it for ammonia, is entirely ignorant of the mode of testing for this alkali. It is the universal practice to moisten the turmeric paper in all cases where we use it as a means of discovering ammonia or any other volatile alkali, and there is no reason for any exception in the case of the alkalies in coal-gas. The gas companies have foolishly taken this absurd way of testing for ammonia in place of my recommendation (a fixed quantity, 5 grains per 100 feet), and they must abide by the consequences. It was at their own request that this process was introduced into the Act, and they cannot, with any pretence in fairness, object to your mode of working.—I remain, dear sir, yours truly,

H. LETHEBY.

Court House, St. Marylebone, June 28, 1861.

Dear Dr. Vinen,—As I am in some measure answerable for the test for ammonia in the Gas Act, I intended that it should apply to moist turmeric, as sugar of lead paper is recommended, which even the most common labourer in a gas-work moistens before testing the gas with it. No chemist that I know of tests with dry turmeric for minute quantities of ammonia with dry litmus.—Very truly yours,

R. D. THOMSON.

Royal Mint, June 29, 1861.

Sir,—I am surprised that any objection should have been made as to the use of moistened turmeric paper for the detection of ammonia. It should, of course, be damp, or slightly wetted, before it is applied.—Yours faithfully,

WM. THOMAS BRANDE.

It was resolved that the above letters should be entered on the minutes.

Dr. BARRON then moved "That the board considered that the course hitherto adopted by their officer in testing the gas had been quite satisfactory, and that they were of opinion that these letters were proof of the same."

The CHAIRMAN having testified to the efficiency and zeal of Dr. Vinen, the motion was seconded and carried.

ST. GEORGE'S (HANOVER SQUARE) VESTRY, JULY 4.

A letter was read from Dr. Aldis, stating that he had found a room where four gases could be tested, and another room, in another district, where the remainder of the gases could be tested.

Mr. ROBINSON suggested that the matter stand over for six months.

Sir J. SHELLEY wished his friend, Mr. Robinson, to give some good reason for asking to postpone the matter.

Mr. ROBINSON thought there was no occasion for the room, and it would only be unnecessary expense, as things were going on well at present.

Sir J. SHELLEY thought that this was not a very good reason for not carrying out the intentions of the Act. He considered that vestries were bound to take such steps as would bring the provision of the Act to bear on the gas companies. It was hardly fair to the Act to neglect its provisions, for in so doing he considered the vestry was not discharging their duty to the ratepayers. Unless he heard better reasons for postponing the matter, he must move an amendment.

Admiral DUNCOMBE considered there were many cogent reasons for adopting Mr. Robinson's motion. The report was in a crude state; and, with respect to testing of the gas, it would not be wise to go to any expense to test only a portion of the gas.

Mr. INGLE said the vestry had appointed a person to do a particular duty, The vestry ought, therefore, to give him the means of carrying out the purposes for which he was appointed, and thus to benefit the ratepayers.

Mr. STANTON said Sir J. Shelley's Act was prejudicial, rather than beneficial to gas consumers.

Mr. WALTON was not quite sure that the motion for postponing the matter for six months did not in reality mean—as was the case elsewhere—"shelving" it altogether. They ought to recollect that gas companies were proceeding for a large increase in their charges for public lamps. As the companies were determined to have the parish money for their gas, he thought the parish ought to take care that it had sufficient gas for its money.

Earl ST. GERMANS did not think the intention of the mover was to "shelve" the question according to parliamentary usage, as the six months motion in the House of Commons had reference to the duration of the sitting of Parliament, a circumstance that could not be said to apply to the Vestry.

Mr. ROBINSON had no desire to "shelve" the question. He wanted the best gas that could be had. The gas supplied was good at present, but it might become bad; then they would have plenty of complaints, and then the vestry might take action.

The motion was carried.

SURREY QUARTER SESSIONS.

GUILDFORD, JULY 1.

REFUSAL TO ADOPT THE SALE OF GAS ACT.

The CLERK of the PEACE having read several memorials praying the magistrates to adopt the Sale of Gas Act,

The CHAIRMAN (Lord Lovaine, M.P.) said, that, with respect to the prayer of these applicants, it was undoubtedly within the power of the justices to order the adoption of the Sale of Gas Act. The difficulty, however, was, that the Act conferred no power upon the court, enabling them to provide for the expense of carrying it out by levying special rates upon those portions of the county which might be benefited; but they must make a general rate over the whole county. As a great portion of the county would derive no benefit whatever from the Act, he thought that the court could not reasonably charge upon the ratepayers at large the expense of putting it into execution.

Mr. BEST said that the chairman had exactly pointed out the objection which he himself entertained to this proposition. He felt that they had no

right to charge the whole expense upon the county generally, when a large proportion would derive no benefit from the adoption of the Act.

Mr. TILSON said, that if these gentlemen would only petition Parliament to give a sufficient fee to the inspectors, these questions would not arise. The difficulty sprung out of the inadequacy of the fee to the inspectors, and the consequent charge upon the county. If, therefore, the memorialists, instead of applying to quarter sessions, would go to Parliament, they would obtain all that they wished, and at the proper cost,—viz., their own.

The CHAIRMAN said that no order would be made upon the subject.

DR. J. NORTHCOTE VINEN'S FORTNIGHTLY REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY.—

Week ending. 1861.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
July 6	4	14·74	12·24	13·39
„ 13	4	14·56	11·39	13·15

The volume of hydrocarbons averaged 5 per cent.; carbonic acid, ·50 per cent.; sulphuretted hydrogen, none; ammonia was present on July 3, 5, 8, and 13. The maximum pressure was 2 inches and 3/10ths; the minimum, 2/10ths; the ordinary working pressure averaged 5/10ths of an inch.

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Rye, Nov. 12, 1860.

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warded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from he latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,

has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.

Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,

to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

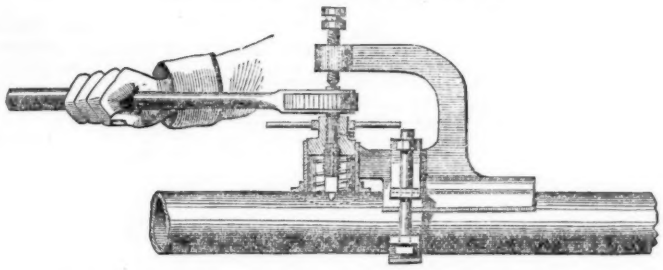
STOCK DIES and SCREWING TACKLE

of the best possible descripton.

Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

UPWARD'S PATENT DRILLING APPARATUS

FOR GAS AND WATER MAINS.



No. 1.—RATCHET BRACE, DRILL POST, CLIPS, BOLTS, TAP DRILL, & NUT, for ¾, 1, 1¼ in., £9 1 0
No. 2.— Ditto Ditto Ditto Ditto, for 1½ in., and 2 in., 10 6 0

MADE BY

BRYAN DONKIN AND CO., ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY,

SOLE LICENSEES.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,

GLOBE PATENT TUBE WORKS, WEDNESBURY,

Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.

Orders promptly executed.

TO Mr. BENJAMIN WHITEHOUSE,
GASHOLDER MAKER,

WESTBROMWICH, NEAR BIRMINGHAM.

Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.

During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.

RICHARD JONES.
Engineer to the London Gaslight Company.
Vauxhall, London, Nov. 9, 1859.

WALTER MABON, Engineer,
ARDWICK IRON WORKS, FAIRFIELD STREET
MANCHESTER,
Manufacturer of
IRON TANKS for Gasholders, Railway Stations, &c.

GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.

GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.

WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.

IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.

PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

THOMAS EDGE,

MANUFACTURER OF PATENT WET AND DRY GAS-METERS,

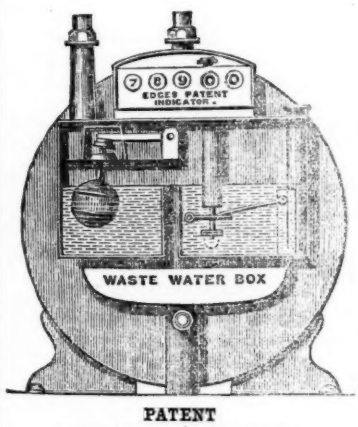
AND GENERAL GAS APPARATUS AND FITTING WORKS,

59, GREAT PETER STREET, WESTMINSTER, LONDON.

Station Meters, Experimental Meters, and Gasholders; Governors, Pressure Registers, By-pass and Slide-Valves, Photometers, &c.

Important Notice.

No. 1.



PATENT
LEVER-VALVE WET METER

Engraving No. 1.

THOMAS EDGE'S Lever-Valve Meter, with Water-Box, to preserve the proper water-level (or measuring-chamber), has now, by the Sale of Gas Act, become the standard Water-Meter for universal use in the United Kingdom. With the addition, in proof of the exclusive advantage of his Meters, that all the common Meters now in use by all Gas Companies, are, by the same Act, condemned to be taken down, and altered to the same principle of regulating the Water-Line. Thousands of these improved Meters have been already manufactured by Mr. Edge.

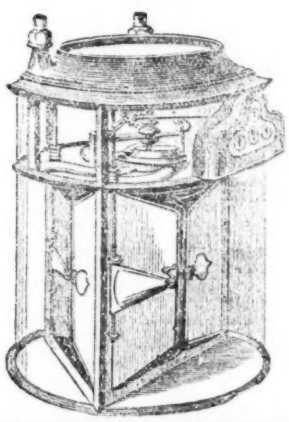
*** The Prussian Government have passed a Law, requiring the same description of Water-Meter to be used throughout that kingdom.

Engraving No. 2.

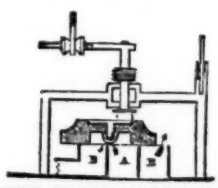
THOMAS EDGE, having patented the first Dry Meter ever invented in this country, has, of late years, discovered the serious defects of the imperfect slide-valve used in all other Dry Meters, which soon allows the gas to pass without being registered by the index; he has, therefore, substituted the very beautiful, action of the Eccentric Rotary Valve, which, by the peculiarity of its movement, has a constant tendency to wipe its surface clean and bright—thereby preventing the possibility of any gas passing without being registered by the index.

This Improved Dry Meter, in addition to its other advantages, can be fixed in warm Kitchens, Sitting-Rooms, or even Bedrooms, it being equally adapted to warmth or to the most intense cold—they having for several years been in constant use in Norway, Sweden, Denmark, &c., &c.

No. 2.



PATENT DRY METER, with ECCENTRIC ROTARY VALVE.



SECTION OF DRY METER VALVE.

GAS-WORKS ERECTED FOR LIGHTING TOWNS, MANUFACTORIES, NOBLEMEN'S & GENTLEMEN'S MANSIONS, ETC.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

R. LAIDLAW & SON,

GAS ENGINEERS, IRON & BRASS FOUNDERS,

Alliance Foundry, 147, East Milton Street, and Barrowfield Iron-Works,

GLASGOW;

AND AT SIMON SQUARE, EDINBURGH;

MANUFACTURERS OF

STATION & CONSUMERS METERS, ALL SIZES;

WROUGHT-IRON TUBES, FOR GAS, WATER, & STEAM; CAST-IRON RETORTS & PIPES;

HYDRAULIC MAINS, CONDENSERS, WASHERS, SCRUBBERS, PURIFIERS, & TANKS.

GASHOLDERS;

GOVERNORS, SLIDE-VALVES, &c.;

WROUGHT & CAST IRON ROOFS & HOUSES.

Contractors for Gas-Works of any Magnitude. *Plans, Specifications, and Estimates furnished.*

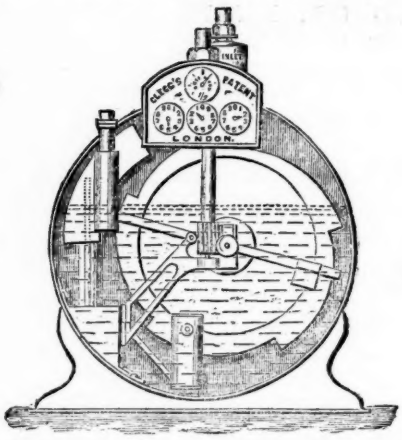
CLEGG'S
NEW PATENT HYDRAULIC GAS-METER.

BISCHOFF, BROWN, & CO.,

MANUFACTURERS

AND

SOLE LICENSEES,



LANGHAM WORKS,

GEORGE STREET,

GREAT PORTLAND STREET,

LONDON, W.

This Meter is the last and one of the greatest achievements of the late SAMUEL CLEGG, C.E., in his connexion with the Manufacture and use of Gas, and, without presumption, it may be confidently affirmed to be the only Meter extant that can be relied upon to measure correctly, to work with the minimum of pressure, and steadiness of light. It cannot be tampered with by tilting or otherwise, and will be of great durability.

This Meter is constructed on an entirely new principle, and, when once adjusted, will always remain the same under all circumstances. The quantity or height of the water in it has no effect on its *capacity*. The immense importance and economy of this to Gas Companies who are obliged to employ so many inspectors, doing their utmost to prevent tampering with the Meters, is so obvious, that they will be able to appreciate its advantages over all other Wet Meters, where the varying height of the water regulates the capacity, and is, in consequence, a perpetual source of annoyance, bad feeling, and litigation, between the Gas Companies and consumers.

The following experiments clearly point out our advantages, and can be readily tested:—

Old Water Meter.

2 pints above the line	5 lights	13½ per cent.	fast.
1 " "	5 "	7½ "	"
Water on the line	5 "	⅛ "	"
1 pint below the line	5 "	5 "	slow.
1½ " "	5 "	7½ "	"
1¾ " "	5 "	10 "	"

A fluctuation of 23½ per cent.

Clegg's New Patent Hydraulic Gas-Meter.

Water on the line	1 inch pressure	5 lights	½ per cent.	slow.
1 pint below	1 " "	5 "	½ "	"
2 " "	1 " "	5 "	½ "	"
2 " "	1½ " "	5 "	right	
2 " "	½ " "	5 "	"	

A fluctuation of ½ per cent.

The Drum, from its peculiar construction, presents scarcely any resistance when moving through the water; and, its weight being taken off its axis by an air vessel, it revolves with the slightest pressure.

The comparative absence of friction in the Drum reduces the wear and tear, and enables it to be made of the strongest materials, which will keep it in working order longer than any other Meter.

It is approved and adopted by the principal London and Country Gas Companies, and is guaranteed to comply with the "Sale of Gas Act," as this Meter, beyond all doubt, works within a shorter range of registration than any other Meter manufactured.

500
HOLMAN'S PATENT DOUBLE-ACTION PUMPS

Prove their general adaptation. They are adopted by

CIVIL, MARINE, MANUFACTURING, AND MECHANICAL ENGINEERS.

For Pumping TAR, AMMONIACAL LIQUOR, WATER, WORT, and other fluids, their intrinsic excellence is too well known to need description.

S. HOLMAN tenders his hearty thanks to all Patrons, and is prepared to undertake the Supply of Towns, Public and Private Establishments, and Irrigation of Lands, on any scale.

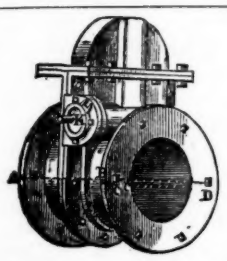
Sole London Agent of the Williams's Perran Foundry Company, for the Sale of Cornish Pumping, Winding, and other Steam-Engines, heavy Machinery, Castings, and Forgings.

London Agent for Tangye's Patent Hydraulic Presses, Jacks, Lifts, Crabs, Cranes, Blocks, &c

ALL KINDS OF HYDRAULIC AND STEAM MACHINERY FOR HOME USE OR EXPORT.

Cornish Boilers of superior construction, Steam-Cocks, Gauges, and Fittings.

S. HOLMAN, C.H.E., 18, CANNON STREET, E.C.



BRYAN DONKIN & CO.

keep always on stock their

IMPROVED GAS VALVES

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

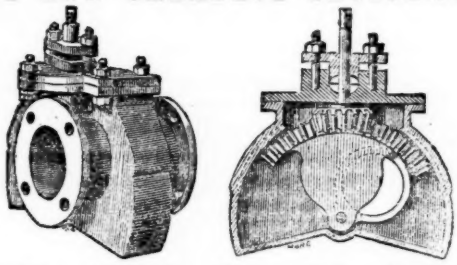
These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,

ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY.

BEST AND CHEAPEST SLUICE-COCK.



BROWN AND MAY'S PATENT.

Above 3-inch diameter, price 10s. per inch. Brass face, 6d. eri nch extra.

Can be taken to pieces without being removed rom the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C., Where a Sample may be seen.

WALTER FORD,

LATE

PADDON and FORD,

GAS-METER AND APPARATUS WORKS,

GRAY'S INN ROAD, LONDON.

MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

JOSEPH BOULTON,

28, BAGNIGGE WELLS ROAD, CLERKENWELL,

PATENTEE OF

DRY & IMPROVED WET GAS-METERS,

AND

GAS APPARATUS.

All Meters warranted to comply with the Act of Parliament.

F. & C. OSLER,

45, OXFORD STREET, LONDON;

Manufactory—Broad Street, Birmingham—Established 1807,

MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

WILLIAM RICHARDSON

(LATE OF DUDLEY),

CONSULTING ENGINEER,

PATENTEE OF THE VERTICAL OVEN RETORT

No. 367, PERSHORE ROAD,

BIRMINGHAM.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET,

DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

JOHN ROGERSON and CO.,

NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

LONDON HOUSE:

12, ROYAL EXCHANGE BUILDINGS.

GAS COAL.

BEAL, WALKER, and CO., Coal and

COKE MERCHANTS, No. 1, Walker's Buildings, SHEFFIELD, beg to inform the Directors and Managers of Gas Companies, that they are in a position to contract for the supply of the different sorts of best Gas Coal, such as best Silkstone, Barnsley, and others, at the lowest prices, which may be had on application at the above Office.

ALFRED PENNY, Gas and

CONSULTING ENGINEER,

WENLOCK IRON WORKS,

21 & 22, WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

Gas Stoves, Gas Baths, Gas Cooking

APPARATUS, warranted the best in England, at PHILLIPS'S, the original inventor and manufacturer, and general gas-fitter, &c., 55, Skinner Street, Snow Hill, LONDON, E.C.

PATENT SAFETY ATLAS CHANDELIERS, Sun and Star Burners, Outside Lamps, Patent Reflecting Lamps, Portable Coppers for either Gas or Fuel. Iron Tube and Fittings. Best quality for Gas, Steam, or Hot Water, &c. &c.

GEORGE ANDERSON, Gas and

CONSULTING ENGINEER,

104, LEADENHALL STREET, LONDON (E.C.).

DIRECT-ACTING GAS-EXHAUSTERS,

supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,

one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,

designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

BENJAMIN GIBBONS, Jun.,

DEEPDALE FIRE-CLAY & BRICK WORKS,

Near DUDLEY,

Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,

TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

References given, if required.

WILLIAM INGHAM AND SONS,
WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

EDWARD COCKEY AND SONS'
PATENT GAS VALVES.

These Valves are formed of two Cast-Iron Cylinders, with segmental divisions, having the faces ground gas-tight—the upper Cylinder turning horizontally on the lower one.

The lower Cylinder has pipes from each division, communicating with the vessels to and from which the gas is to be passed. The upper Cylinder has corresponding divisions, so arranged as to direct the passage of gas to the different segmental divisions in the lower part, and when it is turned on the face of the lower one, to alter the flow of gas from one vessel to another.

Each Valve has an index-plate provided, which is to be attached to the floor, and a pointer on the cover of the Valve shows which way it is turned. Thus, the Manager of the Works can at once see in which direction the gas is passing.

There are about fifty of these Valves now in use, of sizes varying from two to twelve inches, and they are giving great satisfaction. Amongst the Works at which they are fixed, the following may be mentioned:—

BASINGSTOKE.	CANTERBURY.	FROME.	RYDE.
BLANDFORD.	ENNISCORTHY.	GODALMING.	SANDWICH.
CHELTENHAM.	ELGIN.	NEWPORT.	WARMINSTER.

They are in course of erection at other important Works.

IRON WORKS, FROME SELWOOD.

EDWARD COCKEY AND SONS
ALSO MANUFACTURE
PURIFIERS, SCRUBBERS, CONDENSERS, AND OTHER IMPROVED GAS APPARATUS,
HAVING PATTERNS SUITABLE FOR GAS-WORKS OF DIFFERENT SIZES.

WILLIAM SUGG,
MANUFACTURER OF
PATENT DRY AND WATER GAS-METERS, TEST GASHOLDERS, AND APPARATUS,
"EVANS'S" PHOTOMETERS,
Experimental Meters, Minute Clocks, &c., Station Meters and Governors,
STREET-LAMP GOVERNORS AND LAVA BURNERS,
19 and 20, MARSHAM STREET, WESTMINSTER.

FIRE-CLAY GAS RETORTS,

Made of the most refractory Clay in the world, possessing extraordinary properties of contraction and expansion without cracking; having a true form, and perfect internal smoothness.

GLAZED SEWERAGE & WATER-PIPES,

Made up to five feet diameter. Vitrified Pipes, for conveying Water under pressure, made, laid, and guaranteed to stand a required pressure for six months. Every description of sanitary goods.

FIRE-BRICKS, IRON, GLASS, & COPPER FURNACES.

A Pamphlet of Testimonials forwarded on application. Export Orders receive special attention for delivery, free on board, at Liverpool, Hull, or London. Manchester Dépôt, Mill Street, Great Ancoats; F. Tesseyman, Agent.

EDWARD BROOKE, Fieldhouse Fire-Clay Works, Huddersfield.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD, LONDON, S.E.

N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

CROSLEY & CO. are also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by them, and verified by the ASTRONOMER ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by C. & Co. in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." They also supply

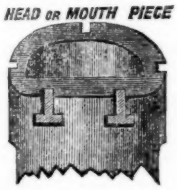
TEST GASHOLDERS,

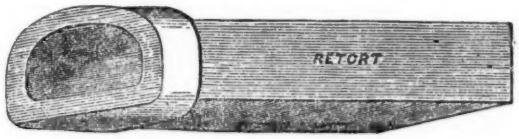
Graduated by the Standard Cubic Foot.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



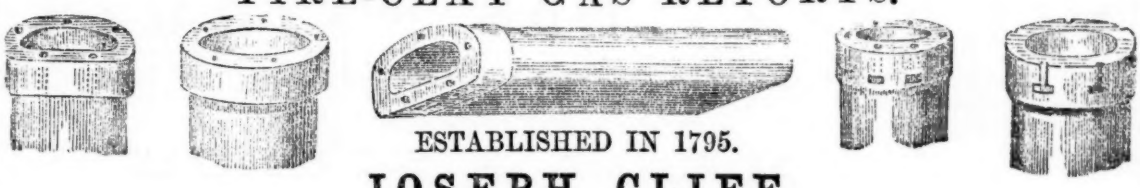


KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

FIRE-CLAY GAS RETORTS.



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